SCHOOL OF
CIVIL ENGINEERING

LIST OF SUBJECTS

Subject Code	Name of the Subject	Credits
13CE307	Experimental Techniques and Instrumentation Methods	4:0:0
13CE308	Energy Conservation Techniques in Building Construction	4:0:0
13CE309	Chemical Behaviour of Concrete Composites	4:0:0
14CE1001	Basic Civil Engineering	3:0:0
14CE2001	Survey	3:0:0
14CE2002	Mechanics of Solids	3:1:0
14CE2003	Mechanics of Fluids	3:1:0
14ME2001	Engineering Mechanics	3:0:0
14CE2004	Building Materials and Geology	3:0:0
14CE2005	Applied Hydraulics and Hydraulic Machinery	3:0:0
14CE2006	Strength of Materials	3:1:0
14CE2007	Soil Mechanics	3:0:0
14CE2008	Water and Waste water Engineering	3:0:0
14CE2009	Reinforced Concrete Structures	3:0:0
14CE2010	Structural Analysis	3:1:0
14CE2011	Water Resources Engineering	3:0:0
14CE2012	Foundation Engineering	3:0:0
14CE2013	Design of Steel Structures	3:0:0
14CE2014	Transportation Engineering	3:0:0
14CE2015	Construction Technology	3:0:0
14CE2016	Strength of Materials Lab	0:0:2
14CE2017	Fluid Mechanics and Machinery Lab	0:0:2
14CE2018	Survey Lab	0:0:2
14CE2019	Building Drawing Lab	0:0:2
14CE2020	Geotechnical Engineering Lab	0:0:2
14CE2021	Environmental Engineering Lab	0:0:2
14CE2022	Concrete and Highway Lab	0:0:2
14CE2023	Computer Application Lab	0:0:2
14CE2024	Design and Drawing (RCC & Steel) Lab	0:0:2
14CE2025	Estimation and Costing	0:0:2
14CE2026	Design and Drawing (Irrigation and Environment) Lab	0:0:2
14CE2027	Engineering Practices Lab	0:0:1
14CE2028	Construction Management	3:0:0
14CE2029	Advanced Reinforced Concrete Structures	3:0:0
14CE2030	Advanced Structural Analysis	3:0:0
14CE2031	Concrete Technology	3:0:0
14CE2032	Basics of Dynamics and Aseismic Design	3:0:0
14CE2033	Building Services	3:0:0
14CE2034	Advanced Structural Engineering Lab	0:0:2
14CE2035	Advanced Computer Application Lab	0:0:2
14CE2036	Prefabricated Structures	3:0:0
14CE2037	Advanced Design of Steel Structures	3:0:0
14CE2038	Industrial Waste Treatment and Disposal	3:0:0

14CE2039	Solid Waste Management	3:0:0
14CE2040	Environmental Chemistry and Micro-Biology	3:0:0
14CE2041	Air Pollution Management	3:0:0
14CE2042	Global Climate Change and its Impact	3:0:0
14CE2043	Disaster Management and Mitigation	3:0:0
14CE2044	Advanced Environmental Engineering Lab	0:0:2
14CE2045	GIS Lab	0:0:1
14CE2046	Smart Materials and Structures	3:0:0
14CE3001	Applied Elasticity and Plasticity	3:0:0
14CE3002	Advanced Concrete Technology	3:0:0
14CE3003	Structural Optimization	3:0:0
14CE3004	Advanced Design of Reinforced Concrete Structures	3:0:0
14CE3005	Structural Dynamics	3:0:0
14CE3006	Finite Element Methods in Engineering	3:0:0
14CE3007	Seismic Design of Structures	3:0:0
14CE3008	Experimental Techniques and Instrumentation	3:0:0
14CE3009	Advanced Design of Metal structures	3:0:0
14CE3010	Advanced Bridge Engineering	3:0:0
14CE3011	Computer Aided Design Laboratory	0:0:1
14CE3012	Advanced Structural Testing Laboratory	0:0:1
14CE3013	Design of Structures for Dynamic load	3:0:0
14CE3014	Design of Space Structures	3:0:0
14CE3015	Design of Tall Buildings	3:0:0
14CE3016	Design of Offshore Structures	3:0:0
14CE3017	Geotechnical Earthquake Engineering	3:0:0
14CE3018	Design of Substructures	3:0:0
14CE3019	Design of Composite Structures	3:0:0
14CE3020	Stability of Structures	3:0:0
14CE3021	Prestressed Concrete Structures	3:0:0
14CE3022	Industrial Structures	3:0:0
14CE3023	Advanced Design of Prefabricated Structures	3:0:0
14CE3024	Analysis and Design of Plates and Shells	3:0:0
14CE3025	Energy Efficient Building	3:0:0

Electives for Non-CBCS students

14CE201	Prefabricated Structures	3:0:0
14CE202	Prestressed Concrete Structures	3:1:0
14CE203	GIS applications in Civil Engineering	4:0:0
14CE204	GIS lab	0:0:1
14CE205	Programming using MatLab	0:0:1

13CE307 EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION METHODS

Credit: 4:0:0

Course Objectives:

- To have a knowledge on the advanced types of equipment used in lab and field
- To understand the testing methods of concrete
- To learn the principles of measurements of static and dynamic response of structures and carryout the analysis of results.

Course Outcome:

Students will

- Gain knowledge on various testing methods and technologies
- Acquire skills for carrying out experiments related to civil engineering problems
- Gain inspiration for lifelong learning towards applying latest equipment in the field

Unit I: Concrete Testing Methods

Determination of cement content – Determination of original w/c ratio – Physical method – Accelerated Curing test

Non-Destructive Test

Tests on composition of hardened concrete - Rebound Hammer Test – Ultrasonic pulse echo, Impact echo, impulse radar techniques – core cutter method - Penetration Techniques — acoustic emission– ultrasonic testing principles and application – Holography – use of laser for structural testing – Brittle coating, Advanced NDT methods:, Ground penetrating radar (GPR) - Resonant frequency methods - Dynamic or vibration methods - Electrical methods - Pullout tests for rehabilitation

Unit II: Strain Measurement:

Introduction – electrical resistance strain gauges – strain gauge circuits – recording instruments – strain analysis methods – Strain rosettes - Photo elastic experiments on disc, beam, frames and other structural models – concept of Moiré' and stress freezing techniques.

Unit III: Tests on Beams and Structures:

Modulus of rupture of plain beams – slope and deflection of beams – shear studies in RC beams – Creep test – Model analysis for concrete structures – Testing on two hinged parabolic arch with variable moment of inertia – fatigue/cyclic load test - Load tests on structural frames.

Unit IV: Equipment and Instrumentation:

Principles of operations of UTM, hydraulic loading systems, force measuring devices, etc., used in the experiments planned in the laboratory - Transducers – types – Linear Variable Displacement Transducers (LVDT) – working principles – Demountable mechanical strain gauges - Load cells - Proving rings - Calibration of testing machines - Long-term monitoring - Vibrating wire sensors - Fibre optic sensors.

Unit V: Testing of Earthquake Resistant Structures

Shake table – working principles – applications - accelerometers – types – Oscilloscope – types - Data acquisition systems – Amplifiers – Vibration generators

Text Books

1. Dalley, J.W and Riley, W.F, "Experimental Stress Analysis", Mc Graw Hill Book Company, New York, 2007
2. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 2006.
3. Chopra, A.K., "Dynamics of structures - Theory and applications to Earthquake Engg", Prentice hall of India, New Delhi, 2002
4. M.S. Shetty, "Concrete Technology- Theory and Practice", S. Chand and Company, New Delhi, 2005

References:

1. Paz Mario," Structural Dynamics - Theory and Computation", CBS publishers, 2003

2. Sirohi, R.S., Radhakrishna, H.C., "Mechanical Measurements", New Age International (P) Ltd, 2004.
3. Bray, D.E. and Stanley, R.K., "Course Material on Non-destructive Evaluation", McGraw Hill Publishing Company, New York, 2006
4. Ganesan, T.P., "Model Analysis of Structures", University Press, India, 2005.

13CE308 ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION

Credit 4:0:0

Course Objectives:

- To enable the students to learn the energy production systems and conservation.
- To study the energy efficient design methods
- To understand the principles of energy management and energy audits

Course Outcome:

Students will be

- Able to understand the concepts of energy efficient design
- Able to design Green and smart buildings and have an exposure in the management of services.
- Able to do energy audit of buildings

Unit I Introduction

Fundamentals of Energy – Energy production systems – Heating, Ventilating and Air-conditioning – Solar Energy and conservation – Geothermal energy - Energy economics Analysis – Energy conservation – Domestic energy consumption – savings – challenges – Primary energy use in buildings – Residential – commercial – Institutional and public buildings

Unit II Environmental Parameters

Energy and resource conservation — Evaluation tools for building energy – Embodied and operating energy – Peak demand – Visual and acoustical quality – Land, water and materials – airborne emissions and Waste Management

Unit III Design

Natural building design consideration – Energy efficient design strategies – Contextual factors –Longevity and process assessment – Renewable energy sources and design –Acoustic Design- Rain Water harvesting -Design of green buildings –Indian Green Building Council and LEED standards - Advanced building technologies – Smart buildings – Economics and cost analysis.

Unit IV Services

Energy in building design – Energy efficient and environmental friendly building – thermal phenomena — climate, sun and solar radiation –Psychometrics – Passive and Active HVAC systems – Preliminary investigations – Goals and policies – Energy audit – Types of Energy Audit – Analysis of results – Energy flow diagram – Energy consumption/Unit production – Identification of wastage –Priority of conservative measures.

Unit V Energy Management

Energy management of electrical equipment – Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – energy savings in lighting systems – Energy management in Façade systems - Air conditioning systems – Applications – Facility operation and maintenance – Facility modifications – Energy recovery dehumidifier – Water heat recovery – Steam plants and distribution systems – Improvement of boiler efficiency – Frequency of blowdown – steam leakage – Steam flash and condense return

Text book:

1. Vaughn Barshaw., "The Building Environment- Active and Passive Control Systems" John Wiley & Sons., 2006.

2. Brown, G.Z, Mark DeKay "Sun, Wind and Light: Architectural design Strategies ", John Wiley & Sons., 2000.
3. Parag Diwan, Mohammed Yaqoot, "Energy Management", Pentagon Press, 2010

References:

1. National Building Code-Part VIII Building Services- Section 4, Acoustics, Sound Insulation and Noise Control- Bureau of Indian Standards, New Delhi, 2005
2. IS: 2526 – 1963 (reaffirmed 1996) Code of Practice for Acoustical Design of Auditoriums and Conference Hall- Ninth reprint December 1998 (incorporating Amendment No: 1) New Delhi
3. IGBC Rating system Abridged Reference Guide, October 2013
4. LEED 2011 for India for New Construction and Core & Shell Projects, Green Building Rating systems – Detailed reference Guide

13CE309 CHEMICAL BEHAVIOUR OF CONCRETE COMPOSITES

Credits: 4:0:0

Course Objectives:

- To enable the student to study the composition and specifications of cement
- To make the student learn the properties of concrete
- To enable the students to understand the microstructure of concrete and the admixtures

Course Outcome:

Students will be

- Able to understand the concepts of chemistry of concrete composites
- Able to identify the suitable composition of concrete composites
- Able to bring solutions to existing problems using composite materials

Unit - I Chemistry of Cement

Introduction – Composition of cement phases – Phase diagrams – Oxide components of cement – Cement related systems – Chemical analysis of Portland cement – Alkali content – Use of compound content in cement specifications

Hydration of Cement

Introduction – Heat of hydration - Hydration of pure clinker minerals – Hydration of silicate, aluminate and ferrite phases – Energy of hydration – Hydration in the absence of sulphate – Hydration of composite cementitious materials

Unit- II Components and Properties of Concrete

Introduction – Types of aggregates – Classification and composition – Properties of natural aggregates – Influence of aggregates on concrete properties –Water and its quality - binders – Interrelation of cement properties to concrete - Durability properties – Influence of aggregates on concrete properties – Iron ore aggregates - Synthetic aggregates

Unit- III Microstructure of Concrete

Introduction – Microstructure of aggregate phase – Water in hydrated cement phase – Significance and influence of interfacial transition zone on properties of concrete – Strength-Porosity relationship - Optical examination of cementitious material – X-ray diffraction analysis – Scanning electron microscopy of cementitious material

Unit - IV Mineral Admixtures

Lime slag cement- Portland blast furnace cement- Composition of blast furnace Slag -Hydration of Portland blast furnace - Ground Granulated Blast Furnace Slag (GGBS) - Cementitious properties of flyash – chemical composition of flyash - Effect of flyash on hydration of cement - Condensed silica fume (CSF) - Pozzolanic material - Chemical resistance – Flyash - CSF combination

Unit - V Chemical Admixtures and Composites

Chemical Properties of: Air-entraining admixtures - Water reducing and plasticizing admixtures - Super plasticizing admixtures - Retarding admixtures - Accelerating admixtures - water proofing admixtures

Polymers: Polymerization - Composite materials - Constituents of Composite materials - Fiber reinforced composites – Layered composites - Processing of fiber reinforced composites

Text Books

1. Neville, A.M., "Properties of Concrete", Pearson Publications, 2006
2. Peter. C. Hewlett, Butterworth, "Lea's Chemistry of Cement and Concrete", Heinemann Publications, 2004
3. J. Bensted and P. Barnes, Taylor and Francis, "Structure and Performance of Cements", e-library, 2008.
4. P. Kumar Mehta and Paulo J.M. Monteiro, "Concrete-Microstructure, Properties and Materials", Tata McGraw Hill Publications, New Delhi, Edition 2006

References

1. Mehta, P.K., and D. Manmohan, "Proceedings of the Seventh International Congress on the Chemistry of Cements", Editions, Septima, Vol.III, Paris 1980.
2. ACI committee report 209R-2, Prediction of creep, shrinkage and temperature effects in concrete structures, ACI manual of concrete practice, American Concrete Institute, Farmington Hills, MI 2005.

14CE1001 BASIC CIVIL ENGINEERING

Credit: 3:0:0

Course Objective:

- To understand the selection of building materials and sites
- To supply the purified water and treat the sewage water
- To produce general layouts on transportation systems.

Course Outcome:

At the end of the course students will be able to

- Apply the basic knowledge of Civil Engineering to further advanced learning concepts.

Description:

Engineering – Civil Engineering – Characteristics of good building materials such as stones, bricks, timber, cement, concrete and steel sections – Basic principles of surveying - Field measurement - Area of a plot - Basic functions of buildings – site selection - Major components of buildings and its construction methods - Valuation of a building by plinth area method - Sources of water supply –water requirements – Purification of water by sedimentation, filtration and disinfection - Rainwater harvesting - Sewerage systems – Working principle of Septic tanks and oxidation ponds – Collection and disposal of solid wastes – Transportation engineering - Classification and cross sections of water bound macadam, bituminous and cement concrete roads - Importance of railways – Gauges – Components of a permanent way - General layout of an airport and harbour – Bridges and its types – Dams, its purpose and its types – Selection of site for a dam - Irrigation and its types.

References:

1. Palanichamy, M. S.,"Basic Civil Engineering", Tata McGraw Hill Publishing Co. Limited, New Delhi, 2008.
2. Ramesh Babu V., 'Basic Civil Engineering', Anuradha Agencies, Kumbakonam, 2001
3. Devadass. C.S.C., Jemimah Carmichael. M and Sheeba Ebenezer. J., "Basic Civil Engineering", Shristi Publishers, Coimbatore, 2004.

14CE2001- SURVEY

Credit: 3:0:0

Co-requisite: 14CE018: Survey Lab

Course Objective:

- To understand the principles of land and hydrographic surveying
- To know the application of surveying in civil engineering projects

Course Outcome:

Students at the end of the course will be able to

- Choose modern survey equipments to measure angles and distances
- Extend the knowledge to other civil engineering field
- Analyze and solve the problems related to survey

Description:

Principle and practices of leveling, contouring, calculation of areas and volumes - Principle and practices of theodolite surveying, omitted measurements, closing error and distribution, heights and distances - Principle of tacheometric surveying, curve surveying – simple curves, transition curves - Triangulation systems, intervisibility of stations, base line corrections, satellite stations : reduction to centre.

References:

1. Duggal, S.K., "Surveying", Volume I and II, McGrawHill & Co., New Delhi 2009
2. Kanetkar, T.P. and Kulkarni, S.V., "Surveying and Levelling", Parts 1 and 2, Pune Vidyarthi Griha Prakashan, 2012.
3. Basak, N., "Surveying and Levelling", McGrawHill & Co., New Delhi 2011.
4. Arthur Bannister, Stanley Raymond, Raymond Baker, "Surveying", Pearson, 2009.
5. Bhavikatti. S.S., "Surveying:Theory and Practice", IK International Publishing House Pvt Ltd, 2010

14CE2002 - MECHANICS OF SOLIDS

Credit: 3:1:0

Co-requisite: 14CE2016: Strength of Materials Lab

Course Objective:

- To learn the state of stress and principal stresses and strains
- To study the Bending moment and shear force of determinate beams
- To study the different types of stresses on structural elements

Course Outcome:

Students at the end of the course will be able to

- Establish the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, material constitutive behavior stress and strain.
- Adopt systematic methods for solving engineering problems in solid mechanics
- Discuss the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading.
- Build the necessary theoretical background for further structural analysis and design courses

Description:

Axial, shear and Thermal stresses and strains in solids- Elastic constants and relationship between them - Analytical method and Graphical methods for determination of Principal stresses and strains - Bending moment and Shear force of determinate beams – Theory of pure bending and elastic torsion -Stresses in beams due to bending, shear and torsion- Strength of section- power transmitted by shafts

References:

1. Egor, P.Popov, "Engineering Mechanics of Solids" ,Prentice Hall of India, New Delhi, 2003
2. Rajput, R.K., "Strength of Materials", S. Chand & Co. Ltd., New Delhi, 2010
3. Bansal, R.K ., "Strength of Materials", Laxmi Publications, New Delh, 2007.
4. Subramanian R., "Strength of Materials", Oxford University Press, 2005
5. Srinath L S., "Advanced Mechanics of Solids", Tata McGraw Hill Publishing 2003.

14CE2003 - MECHANICS OF FLUIDS

Credit: 3:1:0

Course Objective:

- To introduce the fundamental concepts of fluid statics, kinematics and dynamics
- To introduce the concepts of flow measurements, flow through pipes

Course Outcome:

Students at the end of the course will be able to

- Understand the various types of flow and flow profiles
- Carry out flow measurements
- Design pipe networks
- Built capacity to carry out dimensional analysis and model studies

Description:

Fluid Properties and Fluid Statics :Viscocity, Density, Perfect gas, vapour pressure and surface tension- Basic equation of fluid satistics- Pascal's Law- Basic Concepts of Fluid Flow: Classification of flows- streamline, Streak line and pathlines- Flownets- Dynamics- Concepts of system and control volume- Application of control volume to continuity, energy and Momentum- Euler's equation and Euler's equation of motion and Bernouilli's equation- Flow through Pipes: Reynold's number- Laminar flow- Turbulent flow –Energy Loss in pipes – Hydraulic gradient – Energy gradient- Flow Measurement: Venturimeter- orifice meter- pitot tube- mouthpiece and orifice- Open channel flow-Weirs and notches.

References:

1. Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 9th edition, 2011.
2. Modi, P.N. and Seth, S.M., "A Text book of Fluid Mechanics and Hydraulic Machines", Standard Book House, New Delhi, 2007.
3. Som, S.R and Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, 2nd edition, 2007.
4. Hubert Chanson, "Hydraulics of Open Channel flow', Butterworth-Heineman Ltd., 2nd Edition, 2004.
5. Rajput, R.K., "A Text book of Fluid Mechanics and Hydraulic Machines" , S. Chand and Co., New Delhi, 2008.
6. Agarwal, S.K., "Fluid Mechanics and Machinery", Tata Mc Graw Hill Co.New Delhi, 2006.

14CE2004 – BUILDING MATERIALS AND GEOLOGY

Credit: 3:0:0

Course Objective:

- To impart the knowledge of Geology
- To study the basics of seismology

Course Outcome:

Students at the end of the course will be able to

- Classify an appreciation of the geologic processes related to the formation of different soils and rocks
- Define the physical and mechanical soil properties commonly used in engineering practice

- Interpret the causes and mitigation of Land slides

Description:
Building Materials – Bricks, Cement, timber, steel, concrete, water proofing materials - Miscellaneous Building Materials-Properties, tests, applications-General Geology- Geology for engineers- Branches- Geological formations- action of water and wind on rocks- Mineralogy- Study of rock forming minerals - Petrology – Classification- engineering properties and description- Structural Geology- Geological maps- folds, faults and joints, Hydro Geology, Study of structural models- Geophysical methods and Investigations- Investigation of landslides and subsidence- causes and mitigation.

References:

1. Parbin Singh, "Engineering and general Geology", Katson publication House, 2010.
2. Gokhale K.V.G.K. "Principles of Engineering Geology". BS Publications, 2010
3. Bell F G.," Fundamentals of Engineering Geology", Butterworth-Heinemann, 2007.
4. Michael H. De Freeitas, "Engineering Geology", Springer-Verlag Berlin Heidelberg, 2009
5. Chenna Kesavulu., "Textbook of Engineering Geology" 2nd Edition, Macmillan Publishers India Ltd. 2009
6. Varghese P.C., "Building materials ", Prentice Hall, 2005

14CE2005 - APPLIED HYDRAULICS AND HYDRAULIC MACHINERY

Pre-requisite: 14CE2003: Mechanics of Fluids

Credit: 3:0:0

Course Objective:
- To learn the fundamentals on flow in open channels
- To introduce the concepts of boundary layer theory and flow around submerged objects
- To impart the knowledge on pumps and turbines

Course Outcome:
Students at the end of the course will be able to
- Design channels with uniform flow conditions
- Define the displacement, momentum and energy.
- Determine the forces on submerged bodies and the forces due to impact on moving and stationary objects
- Apply the linear momentum principle, Impact and forces exerted by the jet on inclined, curved and stationary bodies
- Build capacity to operate and select turbines and pumps

Description:
Open Channel Flow : Types of flow- Chezy's and Manning's Equation- Specific energy- critical flow- Varied flow: Hydraulic jump- Gradually varied flow- Backwater and drawdown curves- Boundary Layer and Dimensional Analysis: Displacement, Momentum and energy thickness- laminar and turbulent boundary layers- forces on submerged bodies –drag- Momentum Principle: Impulse momentum equation- Application of linear momentum principle- Impact of Jet- Turbines : Typical layout and components of Hydro- electric project- working principles of Pelton wheel, Francis and Kaplan turbine- Draft tube -Specific Speed –Inlet and outlet velocity triangles- Headlosses and efficiency – Specific Speed – Positive Displacement pump: Reciprocating pump- Types and components , working principle- miscellaneous pumps.

References:

1. Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, Edition 9. 2011.
2. Modi, P.N. & Seth, S.M., "A Text book of Fluid Mechanics and Hydraulic Machines", Standard Book House, New Delhi, 19th Edition, 2011.
3. Som, S.R, & Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, Edition 3. 2011.

4. Hubert Chanson, "Hydraulics of Open Channel flow', Butterworth-Heineman Ltd., 2nd Edition, 2004.
5. Rajput, R.K., "A Text book of Fluid Mechanics and Hydraulic Machines", S. Chand and Co., New Delhi, 2006.
6. Agarwal, S.K., "Fluid Mechanics and Machinery", Tata Mc Graw Hill Co., Edition 1. 2002.

14CE2006 - STRENGTH OF MATERIALS

Pre-requisite: 14CE2002: Mechanics of Solids

Credit: 3:1:0

Course Objective:

- To understand the concepts of deflection, stability criteria, theories of failure
- To study the analysis of indeterminate beams

Course Outcome:

Students at the end of the course will be able to

- Independently perform basic calculations and determine the internal mechanical stresses in loaded structural elements
- Develop an understanding of the relation between material properties and strength of materials

Description:

Biaxial bending- Deflection of Determinate beams- Double integration, Macaulay's method - Moment area method - Conjugate beam method - Bending moment and Shear force of Indeterminate beams - Columns and struts - behaviour of axially loaded short, medium and long members - Critical loads with different end conditions - Euler's method, Analysis of thin and thick cylinders, Failure theories, Concept of Shear Center

References:

1. Egor, P. Popov, " Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2006.
2. Rajput, R.K., "Strength of Materials", S. Chand & Co. Ltd., New Delhi, 2006
3. Bansal, R.K., "Strength of Materials", Laxmi Publications Ltd., New Delhi, 2010
4. Bedi, D.S., "Strength of Materials", Khanna Book Publishing Co. (P) Ltd., Delhi, 2003
5. Bhavikatti S..S., "Strength of Materials, 3E", Vikas Publishing House Pvt Ltd, 2009

14CE2007 - SOIL MECHANICS

Credit: 3:0:0

Course Objective:

- To gain knowledge about index and engineering properties of soil
- To study about stress distribution and settlement behaviour of soil
- To gain knowledge on stability of slopes

Course Outcome:

Students at the end of the course will be able to

- Explain the multiphase nature of soils and to derive quantities relating to the volumes and masses of the different phases of a soil
- Describe and classify soils according to Indian Standard
- Determine and describe the engineering properties of soils from tests and basic theories

Description:

Index properties of soil such as water content, specific gravity and classification of soil according to BIS, Phase relations and plasticity characteristics - Engineering properties of soil such as permeability, compaction and consolidation- Stress Distribution analysis by Boussinesq equation and Westergaard's analysis and Causes &

methods of minimizing settlement - Determination of shear Strength by lab and field methods - Stability of slopes - Analysis by slip circle and friction circle method

References:

1. Punmia, B.C., "Soil Mechanics and Foundations", Punmia B.C., Suara & Co., Madras 2005.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers, New Delhi, 2011.
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics", New Age International (P) Limited, 2005
4. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering" Pearson Education, 2008
5. Murthy V N S, "Geotechnical Engineering" Library of Congress Cataloging-in-Publication Data, 2002.
6. IS 2720 (Parts 1 to 10, 13, 14, 30, 36)

14CE2008 - WATER AND WASTE WATER ENGINEERING

Co-requisite: 14CE2021Environmental Engineering Lab

Credit: 3:0:0

Course Objective:

- To educate the students in planning and design concepts related to water storage and distribution
- To educate the students in planning and design concepts relating wasterwater collection, treatment and disposal.

Course Outcome:

Students at the end of the course will be able to

- apply the concept to manage water resources and also apply it for hydrological modeling
- Plan and design basic water resources projects
- List the characteristics of wastewater
- Estimate the quantity of wastewater
- Design and develop appropriate sewerage systems
- Recommend the house connections in civil works

Description:

Water Storage and Distribution: population forecast- water demand for various purposes- estimation of waste water quantity- Water Quality and Treatment: waste water characteristics- Industrial Waste water treatment: Equalisation - Neutralisation - Oil separation - Flotation - Precipitation - Heavy metal removal - Wastewater collection - Wastewater – Primary: Philosophy of treatment- Unit operations of processes-Biological treatment: types of micro-organisms- Aerobic treatment: Suspended growth aerobic treatment process- Secondary treatment and Disposal: Underground drainage systems

References:

1. Arceivala, S. J., "Wastewater Treatment for Pollution Control", Tata McGraw Hill,3rd edition 2006.
2. Bajwa G. S., "Practical Handbook on Public Health Engineering", Deep Publishers, Shimla, 2003.
3. "Manual on water supply and Treatment", CPHEEO, Ministry of Urban Development, GoI, New Delhi, 1999.
4. "Pollution Prevention and Abatement Handbook – Towards Cleaner Production", World Bank and UNEP, Washington, 1998.
5. Barbara Hauser A., "Practical Hydraulics Handbook", Lewis Publishers, New York, 2nd edition, 1995.

14CE2009 - REINFORCED CONCRETE STRUCTURES

Credit: 3:0:0

Course Objective:

- To study the behavior and design of RCC structural elements
- To study the design of supporting components of the buildings

Course Outcome:

Students at the end of the course will be able to

- apply the fundamental concepts of working stress method and limit state method
- apply IS code of practice for the design of concrete elements
- design structural components like water tanks and retaining walls
- detail reinforcement for various RCC structural elements

Description:

Design philosophies – limit state design of one way, two-way, continuous slab and circular slabs – rectangular and flanged beams – axial and eccentrically loaded columns, straight, dog legged and open well staircases, Deep and Shallow foundations – resting on ground and underground water tanks – cantilever and counterfort retaining wall

References:

1. Unnikrishna Pillai and Devdass Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Co. Ltd., 2003
2. Ashok, Kumar Jain, "Limit state design of Reinforced Concrete", Laxmi Publications, New Delhi,. 2007
3. Sinha. S.N. "Reinforced Concrete Design", Tata McGraw Hill, 2002
4. Purushothaman. P, "Reinforced Concrete Structural Elements", Tata McGraw Hill Publishing Co. Ltd., 2006
5. Krishna Raju. N, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors, Delhi 2005
6. IS 456-2000, "Indian Standard Code of practice for Plain and Reinforced concrete Structures", Bureau of Indian Standards, New Delhi.
7. SP 16-1980, "Design Aids for Reinforced Concrete", Bureau of Indian Standards, New Delhi.
8. IS 3370 (Part I) - 1975 - Code of Practice for concrete structures for the storage of liquids, Bureau of Indian Standards, New Delhi.

14CE2010 - STRUCTURAL ANALYSIS

Pre-requisite: 14CE2006 Strength of Materials

Credit: 3:1:0

Course Objective:

- To understand the deflection and force methods for the analysis of structures
- To learn the concepts of moving loads and influence lines
- To study the analysis of indeterminate beams and frames

Course Outcome:

Students at the end of the course will be able to

- Analyze statically determinate trusses, beams, and frames and obtain internal loading
- Analyze cable and arch structures

Description:

Work energy principles – Principle of virtual work-Castigliano's first, second theorem- Williott diagram- Rolling loads and Influence lines- reaction, shear force and bending moment- Muller Breslau's principle -Slope Deflection- Analysis of continuous beams and rigid frames with and without sway, Moment Distribution method – short cut methods – Multistoried frame analysis by substitute frame method, portal and cantilever method.

References:

1. Bhavikatti, S., "Structural Analysis", Vol.1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2003.
2. Devadas Menon, "Advanced Structural Analysis", Alpha Science International, 2009.
3. Norris and Wilber, "Elementary Structural Analysis", Tata McGraw Hill Publishing Co., 2005.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 2005.
5. Vaidyanathan, R. and Perumal,P., "Structural Analysis" Vol.1 & 2, Laxmi Publications, New Delhi, 2004.
6. Pandit, G.S. and Gupta, S.P., "Structural Analysis – A Matrix Approach", Tata McGraw Hill Publishing Co. Ltd., 2006.

14CE2011 - WATER RESOURCES ENGINEERING

Credit: 3:0:0

Course Objective:

- To introduce the concepts of surface and ground water hydrology
- To enable the student to develop skills to appreciate water resources systems

Course Outcome:

Students at the end of the course will be able to

- Select the water sources, treatment and distribution methods
- Acquire skills to undertake major water supply projects

Description:

Surface water hydrology : Hydrologic cycle and hydrological data-forms of precipitation- Hydrologic abstractions- Run-off – flood estimation by emprical formulae-Groundwater Hydrology – types of aquifers- steady flow towards well in confined and unconfined aquifer- pumping test- artificial recharge- conjunctive use of surface and groundwater - Potable Water - Water for Energy and other uses:Basic components of Hydro-electric project , Conservation of water: Reservoir- Single and multi purpose – Flood levees and flood walls.

References:

1. Linsley, R. K. and Franzini, J.B., "Water Resources Engineering", McGraw Hill Inc, 4th edition 2013.
2. Subramanya, K., "Engineering Hydrology", Tata McGraw Hill,4tn edition, 2013.
3. Sahasrabudhe, S.R., "Irrigation Engineering and Hydraulic Structures", Katson Publishers, 3rd edition,2011.
4. Garg S. K., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 2009.
5. Michael, A.M., "Irrigation – Theory and Practices", Vikas Publishing House, New Delhi, 2004

14CE2012 - FOUNDATION ENGINEERING

Pre-requisite: 14CE2007 Soil Mechanics

Credit: 3:0:0

Course Objective:

- To gain knowledge about exploration and bearing capacity of soil
- To study about types, selection and design of foundation
- To gain knowledge about pile and shallow foundation in detail

Course Outcome:

Students at the end of the course will be able to

- Apply the basic theories in determining suitable soil parameters.
- Interpret the application of field and laboratory tests
- Perform geotechnical design of shallow and deep foundations and understand limitations and uncertainties in geotechnical design.
- Develop an appreciation of the modes of failure of retaining walls and foundation supports.

Description:
Objectives of Soil Exploration, sampling methods and requirement, Choices - factors governing selection of foundation - Bearing Capacity of soil - Analysis by Terzaghi and Skempton, Determination and methods of improving - Earth Pressure analysis by Rankine, Coulomb, Culmann and Rehbann's methods, Design of shallow foundations such as rectangular combined footing & trapezoidal combined footing and types, functions and designing of deep foundations, Sheet Pile walls.

References:

1. Punmia, B.C., "Soil Mechanics and Foundations", Punmia B.C., Suara & Co., Madras 2005
2. Kasmalkar, B.J., "Foundation Engineering", Pune, Vidyarthi Griha Prabakar, Pune, 2002.
3. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers, New Delhi, 2011.
4. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", Pearson Education, 2008
5. Murthy V NS., "Geotechnical Engineering" Library of Congress Cataloging-in-Publication Data, 2002

14CE2013 - DESIGN OF STEEL STRUCTURES

Credit: 3:0:0

Course Objective:
- To study the design of connections
- To study the design of axial and flexural members
- To study design of roof truss

Course Outcome:
Students at the end of the course will be able to
- Design the structural elements and its joints
- Classify the structural steel connections in industrial building
- Evaluate the strength of light gauge steel elements

Description:
Concepts of steel design – Design of Bolted and Welded connections - Design of Members for Axial forces – Tension splices-lug angle - Design of lacings, battens and Column bases - Design of Flexural Members - beams, rolled and built-up section- laterally restrained and unrestrained beams, welded plate girder and Beam Columns - Design of Industrial Roof Truss and Gantry Girder .

References:

1. Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi 2008.
2. Duggal S.K, "Limit State Design of Steel Structures", Tata Mc Graw Hill Education Private Limited, New Delhi, 2010
3. "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta
4. Bhavikatti S.S.,"Design of Steel Structures (By limit state method as per IS 800:2007)" I K International Publiishing house pvt ltd, 2010
5. IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi.

14CE2014 TRANSPORTATION ENGINEERING

Credit: 3:0:0

Course Objective:
- To impart knowledge in planning, geometric design, construction and operation of highways and railways
- To understand the layouts and operation of airport and harbours

Course Outcome:
Students at the end of the course will be able to
- Classify the different types of transportation engineering

- Plan various public transportation system
- Classify and design roads as per IRC Standards
- Design pavements as per IRC recommendations
- Demonstrate various test methods for highway materials
- Plan, design airports and harbors and recognize its operation

Description:
Introduction to Transportation Engineering - Planning and Geometric design of highways - super elevation – design principles of flexible and rigid pavements – Defects in pavements - Planning, Geometric design and construction of Railways – Maintenance and materials- Conventional and modern methods (GIS and GPS), Airport planning, wind rose diagram, runway design and airport terminal buildings - Planning of harbor terminal buildings – Navigational aids and coastal structures – Dredging methods

References:

1. Saxena S.C and Arora S.P., "A Text book of Railway Engineering", Dhanpat Rai Publishers,2001
2. Khanna, S.K., and Justo C.E.G., "Highway Engineering", Nem Chand and Bros, 2005.
3. Oza H. P. and Oza G. H., "Dock and Harbour Engineering", Charotar Publishing House, New Delhi, 2013.
4. Rangwala, S. C., "Airport Engineering", Charotar Publishing House, New Delhi, 2013.
5. Narasimha Murthy A.S, Henry R. Mohle., "Transportation Engineering Basics" ASCE press 2000.

14CE2015 – CONSTRUCTION TECHNOLOGY

Credit: 3:0:0

Course Objective:
- To impart knowledge about site planning and construction of foundations.
- To study the various methods of constructions and service requirements
- To understand the usage of equipments for construction

Course Outcome:
Students at the end of the course will be able to
- Classify the different types of construction materials
- Select the construction methodology for different types of construction
- Plan and execute construction projects
- Tell about disposal of effluents and the standards for disposal
- Maximize the knowledge on waste management
- Develop skills to undertake major project related to industrial treatment

Description:
Planning of Building –setting of foundation- Methods of Construction – Concrete, Steel, Brick and Stone masonry, Hollow block masonry, pre-cast, roofs, expansion joints, damp proof course, Composite-Formwork, shoring, underpinning and scaffolding – Service and safety requirements - Construction equipments.

References:

1. Varghese P.C, "Building Constructions", Prentice Hall, 2007
2. Rangwala S.C., "Building Construction", Charotar Book Stall, Anand, 2003
3. Punmia, B.C., "Building Construction", Laxmi Publications (P) Ltd., 2008
4. Relevant IS Codes and National Building Code of India, 2005
5. Sushil Kumar, "Building Construction", Standard Publishers, New Delhi, 2003
6. Arora, S.P. and Bindra, S.P., "Building Construction", Dhanpat Rai and Sons, 2003

14CE2016 – STRENGTH OF MATERIALS LAB

Co-requisite: 14CE2002 Mechanics of Solids

Credits: 0:0:2

Course Objective

- To apply the theory of mechanics of solids on real specimens
- To give hands on training on testing of real specimens

Course Outcome

Students at the end of the course will be able to

- Determine the important mechanical properties of materials
- Identify the materials for practices based on mechanical properties
- Verify the theorem studied in engineering mechanics

Experiments

The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Jindal, U.C, "Strength of Materials", Asian Books Pvt. Ltd, 2007

14CE2017 - FLUID MECHANICS AND MACHINERY LAB

Co-requisite: 14CE2005 Applied Hydraulics and Hydraulic Machinery

Credit: 0:0:2

Course Objective:

- To give hands on training on the principle and working of different types of turbines
- To impart knowledge on open channel flow profiles

Course Outcome:

Students at the end of the course will be able to

- Adopt the working principles and select the turbines
- Identify various forms of open channel flows

Experiments

The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Modi, P.N and Seth, S.M., "Fluid Mechanics & Fluid Machines", Standard Book House, New Delhi, 2007.
2. Rajput, R.K., "A Text book of Fluid Mechanics and Hydraulic Machines", S.Chand and Co., New Delhi, 2002.

14CE2018 - SURVEY LAB

Co-requisite: 14CE2001 Survey

Credit: 0:0:2

Course Objective:

- To train the students to acquire skill in operation of various survey instruments

- To give hands on training on the use of conventional and modern tools of surveying

Course Outcome:
Students at the end of the course will be able to
- Acquire skill in operation of various survey instrument
- Develop an understanding on the use of conventional and modern tools of surveying
- Demonstrate various types of surveys

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Kanetkar, T.P and Kulkarni, S.V., "Surveying and Levelling", Part 1 and 2, Pune Vidyarthi Griha Prakashan 2010.
2. Basak, N., "Surveying and Levelling", McGrawHill & Co. 2011.

14CE2019 - BUILDING DRAWING LAB

Credit: 0:0:2

Course objectives:
- To understand the principles of planning and bylaws
- To draw plan, elevation and section of load bearing and framed structures
- To draw plan, elevation and section of public and industrial structures
- To prepare detailed working drawing for doors, windows, etc.

Course outcomes:
Students at the end of the course will be able to
- Understand the principles of civil engineering drawing
- Plan Residential and commercial buildings

Description:
Building planning - Building bye-laws- Building Information model (BIM) - Detailed drawings using AutoCAD

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References

1. Shah M.G. Kalec. M. & Patki SY, "Building Drawing", Tata Mcgraw Hill, New Delhi, 2000
2. AUTO CAD Tutorials and Manual- Autodesk Work Book on AUTO CAD Level I and II, CAD/CAM Centre, Coimbatore
3. Gurucharan Singh and Jagdish Singh, "Building Planning, Designing and scheduling", Standard Publishers, New Delhi, 2001
4. IS: 962 – 1967, Code of Practice for Architectural and Building Drawing, Bureau of Indian Standards, New Delhi
5. IS: 3021 – 1983, Specification for Timber Door, Window and Ventilator Frames, Bureau of Indian Standards, New Delhi
6. IS: 1003 – 1977, Part I, II Specification for Timber Panelled and Glazed Shutters, Bureau of Indian Standards, New Delhi
7. Revit Package Manual

14CE2020 - GEOTECHNICAL ENGINEERING LAB

Co-requisite: 14CE2007: Soil Mechanics

Credit: 0:0:2

Course Objective:

- To determine the index and engineering properties of soil
- To classify the soil according to IS

Course Outcome:

Students at the end of the course will be able to

- Explain the multiphase nature of soils and to derive quantities relating to the volumes and masses of the different phases of a soil
- Describe and classify soils according to Indian Standard
- Determine and describe the engineering properties of soils from tests and basic theories

Experiments

The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Lambe, T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.
2. IS 2720-1983, "Indian Standard Code of Practice: Methods of tests for Soil", Bureau of Indian Standards, New Delhi

14CE2021 - ENVIRONMENTAL ENGINEERING LAB

Co-requisite: 14CE2008 Water and Waste Water Engineering

Credit: 0:0:2

Course Objective:

- To make the students conversant with the experimental procedures for quantitative estimation of water quality parameters
- To give hands on training on the testing of wastewater quality

Course Outcome:

Students at the end of the course will be able to

- Recall the characteristics of water and wastewater
- Examine the water quality parameters
- Categorize the water samples according to BIS standards
- Recommend for necessary water or wastewater treatment required

Experiments

The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References

1. Sawyer, N.C., and McCarty, P.L., "Chemistry for Environmental Engineering", McGraw-Hill Book Co., New York, 2003.
2. "Standard Methods for the Examination of Water and Waste Water", APHA- AWWAWPCF, latest Edn.,Washington (D.C). 1995

14CE2022 - CONCRETE AND HIGHWAY LAB

Credit: 0:0:2

Course Objective:

- To give hands on training in testing of cement and aggregates
- To give hands on training in testing of concrete and highway materials
- To impart knowledge on mix design procedures

Course Outcome:

Students at the end of the course will be able to

- Test all the concrete materials as per IS code
- Design the concrete mix using ACI and IS code methods
- Determine the properties of fresh and hardened of concrete
- Measure the physical properties of the bitumen

Description:

Destructive and non destructive tests on constituents of concrete - Tests on aggregates, bitumen and bituminous mixes

Experiments

The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Shetty, M. S., "Concrete Technology", S. Chand and Co., New Delhi, 2005
2. Gambhir, M.L., "Concrete Technology – Theory and Practice", Tata McGraw Hill Publishing Ltd, New Delhi, 2009
3. IS 2386 – 1963 Part I, III, "Methods of test for aggregate for concrete", Bureau of Indian Standards, New Delhi.
4. IS 516 – 1959," Method of test for strength of concrete", Bureau of Indian Standards, New Delhi.
5. IS 10262-2009, "IS standard for recommended guidelines for concrete mix design", Bureau of Indian Standards, New Delhi.

14CE2023 - COMPUTER APPLICATION LAB

Pre-requisite: 14CE2011 Structural Analysis

Credit: 0:0:2

Course Objective:

- To give hands on training on Matlab Programming
- To analyze and design various structural elements using STAAD Pro

Course Outcome:

Students at the end of the course will be able to

- Create 'c' programs for analysis and design of structures
- Develop spreadsheets in Ms Excel to solve problems in civil engineering
- Formulate programs and spreadsheets for economical design of structures

Description:

Developing Matlab program for the design of structural elements – Project management software - Analysis of structures using STAAD Pro software

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Rudra Pratap, "Getting Started with MATLAB", Oxford University Press, 2002
2. STAAD Pro Package Manual

14CE2024 - DESIGN AND DRAWING (RCC & STEEL) LAB

Pre-requisite: 14CE2009 Reinforced Concrete Structures
14CE2013 Design of Steel Structures

Credit: 0:0:2

Course objectives:
- To design and detail RCC structures
- To design and detail steel structures

Course outcomes:
Students at the end of the course will be able to
- Summarize the reinforcement detailing in the field
- Design various structures for the requirements of the society as per IS codes
- Develop the reinforcement detailing for various structures for various structures

Description:
Detailed design of the reinforced concrete structures and drawing using software - Detailed design of the steel structures and drawing using software

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Dayaratnam P., "Design of Reinforced Concrete Structures", Oxford & IBH Publishers & Co., New Delhi, 2011
2. Victor, D.J., "Essentials of Bridge Engineering", Oxford & IBH Publishers Co., New Delhi. 2009
3. IS456-2006 Code of practice for Plain and reinforced concrete code of practice.
4. SP-34-1987, Handbook on Reinforcement and Detailing.
5. SP 6: Part 1: 1964, Handbook for Structural Engineers - Structural steel sections.
6. IS 800-2007, "General Construction in Steel - Code of Practice", Bureau of Indian Standards, New Delhi.

14CE2025 - ESTIMATION AND COSTING

Credit: 0:0:2

Course Objective:
- To impart techniques of estimation of buildings, roads and irrigation structures
- To introduce the concepts of rate analysis

Course Outcome:
Students at the end of the course will be able to
- Execute rate analysis of various works in construction
- Estimate the total construction cost of the structure

Description:
Estimate of buildings - Estimate of road, sanitary and retaining structures - Specification and tenders – Valuation - Report preparation

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Dutta.B.N, "Estimating and Costing", UBS Publications, 2005.
2. Rangawala..S.C., "Estimating and Costing", Charotar Anand, 2002.
3. IS 1200-1 (1992): Methods of measurement of building and civil engineering works, Part- 1: Earthwork [CED 44: Methods of Measurement of Works of Civil Engineering]
4. IS: 1200 - 1974- Parts 1 to 25, Methods of Measurement of Building and Civil Engineering Works, Bureau of Indian Standards, New Delhi.

14CE2026 - DESIGN AND DRAWING (IRRIGATION AND ENVIRONMENT) LAB

Pre-requisite: 14CE2008 Water and Waste Water Engineering
14CE2011 Water Resources Engineering

Credit: 0:0:2

Course Objective:
- The purpose of this course is to impart the knowledge about the design of irrigation and environmental engineering structures
- To get hands-on experience in drawing of irrigation and environmental engineering structures

Course Outcome:
Students at the end of the course will be able to
- design and drawing of various irrigation structures
- Match the requirements of irrigation design engineers in large and small consulting firms, and at all levels of government and Private sectors

Description:
Design of major irrigation works to be worked out and detailed drawings using software- Design of major environmental engineering works to be worked out and detailed drawings using software.

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Ellis, W.M., College of Engineering Manual: Irrigation, The Textile Institute Publishers, 2012.
2. Santosh Kumar Garg., "A Text Book of water supply Engineering", Khanna Publishers, 2010

14CE2027 - ENGINEERING PRACTICES LAB

Credit: 0:0:1

Course Objective:
- To study the basic practices in civil engineering construction

Course Outcome
Students at the end of the course will be able to

- Inspect electrical and plumbing work for buildings and factories
- Explain the bar bending schedule to supervisors
- Select appropriate flooring for building work

Description:
Plumbing and electrical services - Welding joints - Bar bending - Brickwork –plastering- floor finish

Experiments
The faculty conducting the Laboratory will prepare a list of 6 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Saravanapandian M, Pranitha S, Jeyapoovan T., "Engineering Practices Laboratory Manual", VRB Publishers Private Ltd 2009
2. Jeyachandran.K., Natarajan.S. and Balasubramanian.S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
3. Bawa.H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
4. Rajendra Prasad.A. and Sarma.P.M.M.S., "Workshop Practice", Sree Sai Publication, 2002.

14CE2028 - CONSTRUCTION MANAGEMENT

Credit: 3:0:0

Course Objective:

- To introduce the concepts of management, resources and construction planning
- To introduce the labour laws, principle of accounting
- To introduce fundamentals and concepts of computer applications in construction management

Course Outcome:
Students at the end of the course will be able to

- Manage the resources and labours in the construction
- Plan the construction projects
- Estimate the cost of the projects and evaluate the tenders

Description:
Management Principles –Functions – Construction Management - Quantity method of management- management by network analysis and control – CPM/PERT - control by graphical representation, by bill of quantities and by network analysis - Tender and tender documents- Definition - calling of tenders - tender documents - submission of tenders - processing of tenders - negotiations and settlement of contracts – Contracts –Arbitration- Software applications in Recording and Operations – Environment health and safety (EHS)

References:

1. Seetharaman, S., "Construction Engineering and Management", Umesh Publications, 2007.
2. Sengupta, B., and Guha, H., "Construction Management and Planning", Tata McGraw-Hill Book Co., 2000.
3. Rana,V.K., "Construction Management Practice", Tata McGraw-Hill publishing Co.,2000.
4. Chitkara, K.K., "Construction Project Management", Tata McGraw-Hill publishing Co., 2000.
5. Sharma, J.L., "Construction Management and Accounts", Sathya Prakashan, New Delhi, 2011.

14CE2029 – ADVANCED REINFORCED CONCRETE STRUCTURES

Pre-requisite: 14CE2009 Reinforced Concrete Structures

Credit: 3:0:0

Course Objective:

- To study the design on structural components
- To study design of bridges for IRC loadings

Course Outcome:

Students at the end of the course will be able to

- Adopt the design methods
- Design the advanced reinforced concrete structures like brideges, corbels etc.
- Verify the structural stability.

Description:

Design of flat slab- components - BIS codal recommendations, direct tension method - Equivalent frame method – Design of box culverts and road bridges (slab and T beam) as per IRC codal provisions – Design of Corbels and brackets – Design of deep beam, grid floor – Design of RCC domes

References:

1. Unnikrishna Pillai and Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Co. Ltd. 2003
2. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt. Ltd. 2000
3. Punmia.B.C., Ashok, K. Jain., Arun.K.Jain , "Limit State Design of Reinforced Concrete", Laxmi Publications (P). 2007
4. Krishna Raju, N, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors, Delhi. 2005
5. IS 456-2000, "Indian Standard Code of practice for Plain and Reinforced concrete Structures", Bureau of Indian Standards, New Delhi.
6. SP 16-1980, "Design Aids for Reinforced Concrete", Bureau of Indian Standards, New Delhi.
7. IRC Bridge Codes, IRC-21 and Pigeaud's charts

14CE2030 ADVANCED STRUCTURAL ANALYSIS

Pre-requisite: 14CE2010: Structural Analysis

Credit: 3:0:0

Course Objective:

- To impart knowledge about arches, suspension bridges and space trusses
- To analyze indeterminate structures using flexibility and stiffness method
- To determine shear centre and analyze curved
- To apply analysis to Civil Engineering Structures

Course Outcome:

Students at the end of the course will be able to

- Demonstrate the basic concept of numerical analysis and formulation of analytical models of structure
- Identify degrees of freedom and formulate flexibility and stiffness matrix
- Interpret the concept of structural stability and its significance in structural design
- Apply the theoretical concepts in computer applications for structural analyses

Description:
Arches-parabolic and semi circular arches- cables and suspension bridges - Analysis of space trusses – Matrix flexibility method – Determinate and indeterminate trusses, beams and frames-Matrix stiffness method- Determinate and indeterminate trusses, beams and frames - curved beams.

References:

1. Norris and Wilber, "Elementary Structural Analysis", Tata McGraw Hill Publishing Co., 2005.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications, New Delhi, 2004.
3. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 2005.
4. Vaidyanathan, R. and Perumal, P., "Structural Analysis", Vol.1 & 2, Laxmi Publications New Delhi,2004.
5. Pandit, G.S. and Gupta, S.P., "Structural Analysis – A Matrix Approach", Tata McGraw Hill Publishing Co. Ltd., 2006.
6. Wang, C.K., "Intermediate Structural Analysis", Tata McGraw-Hill Publishing Co., 2010

14CE2031 - CONCRETE TECHNOLOGY

Credit: 3:0:0

Course Objective:
- To study about the constituents of concrete
- To study the properties of fresh and hardened concrete
- To understand the concepts of mix design methods

Course Outcome:
Students at the end of the course will be able to
- Understand about concrete making materials, properties of fresh and hardened concrete
- Apply the concepts of durability of concrete, special concretes and non- destructive testing of concrete
- Design the concrete mixes by various mix design methods
- concrete mixes by various mix design methods

Description:
Concrete- Constituents: cement, fine aggregates and coarse aggregates, Admixtures: chemical and mineral, Properties, Compositions and Tests - Properties of Fresh Concrete- workability, segregation, bleeding, mixing compaction and curing - strength and durability studies on Hardened Concrete - Mix Design: BIS, ACI and BS method - special concrete: light weight concrete, ready mix concrete, fiber reinforced concrete, Aerated concrete, No fines concrete, high strength concrete, ferrocement, high performance concrete, shortcrete, pumped concrete, preplaced concrete - repair and rehabilitation.

References:

1. Neville, A.M., "Concrete Technology", Longman Scientific & Technical, 2005.
2. Gambhir, M.L., Concrete Technology, Tata Mc Graw Hill Publishing Company limited, New Delhi, 2004
3. Shetty, M.S., "Concrete Technology", S.Chand & Co., New Delhi, 2013
4. Santhakumar A.R, "Concrete Technology" Oxford University press, Jai Singh road, Delhi, 2006
5. Adam Neville, "Concrete: Neville's insights and issues", Thomas Telford Books, 2006

14CE2032 - BASICS OF DYNAMICS AND ASEISMIC DESIGN

Credit: 3:0:0

Course Objective:
- To introduce to the student the phenomena of earthquakes, the process, measurements and the factors that affects the design of structures in seismic areas.
- To introduce the concepts of seismic design of buildings
- To understand codal provisions and the aseismic design methodology.

Course Outcome:
Students at the end of the course will be able to

- Apply the basic concept of seismic design of concrete structures.
- Adopt design methods for various structures.

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Description:
Theory of vibrations – One degree, two degree of freedom system with and without damping- free and forced vibration-Response spectrum- Seismology-Plate tectonics- lessons from past earthquakes-seismic zone map of India- Seismic analysis of RCC and steel building using codal provision- improving seismic resistance of masonry buildings-strong column-week beam concept- Ductile detailing - Seismic strengthening and Structural control methods –Base isolation, bracings, dampers.

References:

1. Pankaj Aggarwal, Manish Shrikande, "Earthquake resistant design of structures", Prentice Hall of India, Delhi, 2006
2. Anil K. Chopra, "Dynamics of structures- Theory and applications to earthquake engineering", Prentice hall of India, New Delhi, 2007
3. Mario Paz, M., "Structural Dynamics – Theory & Computation", CSB Publishers & Distributors, Shahdara, Delhi, 2004
4. NPEEE Publications, 2005
5. Roy R Craig Jr, Andrew J Kurdila., "Fundamentals of Structural Dynamics", John Wiley and Sons, 2011
6. IS1893:2002, Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi
7. IS 13920:1993, Ductile detailing of Reinforced Concrete Structures subjected to seismic forces, Bureau of Indian Standards, New Delhi

14CE2033 - BUILDING SERVICES

Credit: 3:0:0

Course Objective:

- To learn about water supply and sanitation arrangements in a building
- To understand the essentials of electrical installations in a building
- To get an exposure to air conditioning and fire safety arrangement
- To pioneer the concepts of intelligent building

Course Outcome:
Students at the end of the course will be able to

- Explain different services required for building
- Classify different types of air conditioning systems.
- Plan electrical, sanitation and air conditioning system in the building

Description:
Building Sanitation and Byelaws- septic and sewage treatment plant-Rain water harvesting - Electrical Installations in Buildings-wiring system-main and distribution boards, transformers, switch gears-lighting design - Air Conditioning System and Applications- Natural and artificial ventilation - Fire Safety control measures and Regulations - Introduction to Intelligent buildings- building automation- green buildings, Smart buildings.

References:

1. Arceivala, S. J., "Wastewater Treatment for Pollution Control", Tata McGraw Hill, 3rd edition 2006.
2. Bajwa G. S., "Practical Handbook on Public Health Engineering", Deep Publishers, Shimla, 2003.
3. National Building Code-Part VIII Building Services- Section 4, Acoustics, Sound Insulation and Noise Control- Bureau of Indian Standards, New Delhi, 2005.

4. IS: 2526 – 1963 (reaffirmed 1996) Code of Practice for Acoustical Design of auditoriums and Conference Hall- Ninth reprint December 1998 (incorporating Amendment No: 1) New Delhi.
5. Shengwei Wang**,** "Intelligent Buildings and Building Automation", Spon Press, London, 2009.

14CE2034 - ADVANCED STRUCTURAL ENGINEERING LAB

Credit: 0:0:2

Pre-requisite: 14CE2031 Concrete Technology
14CE2009 Reinforced Concrete Structures

Course Objective:

- To learn the concepts of mix design
- To understand the flexural behaviour of RCC and steel beam by experimental Investigation
- To get an exposure on NDT methods

Course Outcome:
Students at the end of the course will be able to

- Experiment with RCC and Steel beam and column
- Determine the behaviour of concrete materials
- Design the mix proportions of concrete

Description:
Mix Design - High performance concrete – behavior of beams, columns, slabs – NDT Tests – Steel beam, column test – joints test - frame test.

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. ACI Manual of Concrete Practice, Part 3 and Part 5
2. IS 2386 – I, II – Methods for test of aggregates for Concrete, Bureau of Indian Standards, New Delhi
3. IS 10262 Indian Standard code for Concrete Mix Design, Bureau of Indian Standards, New Delhi

14CE2035 – ADVANCED COMPUTER APPLICATION LAB

Credit: 0:0:2

Pre-requisite: 14CE2010: Structural Analysis
14CE2009: Reinforced Concrete structures
14CE2013: Design of Steel Structures

Course Objective:

- To analyze and design various structural elements using SAP/ETABs and Matlab
- To analyze the structural elements using ANSYS Software

Course Outcome:
Students at the end of the course will be able to

- Model 2D and 3D building frames using STAAD
- Analyse the RCC and steel building frame
- Design the structural elements

Description:
Analysis of structures using SAP/ETABs, Matlab

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:
1. SAP / ETABS Package Manual
2. ANSYS Package Manual
3. Matlab Manual

14CE2036 PREFABRICATED STRUCTURES

Pre-requisite: 14CE2009: Reinforced Concrete structures

Credit: 3:0:0

Course Objective:
- To study the design of Prefabricated structural components and its joints
- To study the design of prefabricated structures subjected to dynamic forces

Course Outcome:
Students at the end of the course will be able to
- Adopt the prefabrication technique and methodology of residential structures
- Adopt the prefabrication technique of various industrial structures

Description:
Prefabrication and its components - Modular co-ordination- standardization systems- production- transportation- erection- Behaviour of Structural components- construction of roof and floor slabs-wall panels-columns-shear walls - Design principles- Disuniting of structures- Design of cross section based on efficiency of material used - Joints in Structural members - Design for dynamic forces – Progressive collapse-Equivalent design loads for considering abnormal effects such as earthquake, cyclones, explosions and fire

References:

1. John D. Quale., "Sustainable, Affordable, Prefab: The EcoMOD Project", University of Virginia Press, 2012
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 2012
3. Koncz T., "Manual of precast concrete construction", Vols. I, II and III, Bauverlag, GMBH, 1971.
4. Kim S Elliott, Colin Jolly., "Multi-Storey Precast Concrete Framed structures", Wiley, 2013
5. Colin Davies., "The Prefabricated Home", Reaktion Books, 2005

14CE2037 - ADVANCED DESIGN OF STEEL STRUCTURES

Credit: 3:0:0

Course Objectives
- To study the design of advanced types of framed connections
- To study the concepts and design of pre-engineered buildings
- To study the analysis and design of towers and chimneys
- To understand the behaviour of composite members and design the composite slab, beam and column

Course outcomes:
Students at the end of the course will be able to
- Classify different types of bolted and welded joints
- Design the steel beam and columns

- Plan, analyse and design the industrial building

Description:
Design of bolted and welded connections for framed structures and advanced connections – stiffened and unstiffened seat connections - Design of Industrial bents, sway and non-sway frames, Gable column, purlins and bracings – Analysis and design of Towers and Chimneys - Design of Steel Concrete Composite Beams and Columns – IS and Euro codal provisions – ultimate load theory – design of shear connectors – Composite deck slab

References:

1. Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi, 2008
2. Duggal S.K, "Limit State Design of Steel Structures", Tata Mc Graw Hill Education Private Limited, New Delhi, 2010
3. "Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta, 2003
4. IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi.
5. Johnson R.P., "Composite Structures of Steel and Concrete", Blackwell Scientific Publications, 2004

14CE2038 - INDUSTRIAL WASTE TREATMENT AND DISPOSAL

Credit: 3:0:0

Pre-requisite: 14CE2009 Water and Waste water engineering

Course Objective:
- To know the effects, importance and fundamental methods in Industrial waste treatment
- To impart knowledge about disposal of effluents and the standards for disposal

Course Outcome:
Students at the end of the course will be able to
- Select suitable method for industrial waste treatment and disposal
- Design industrial waste treatment plant
- Determine the water quality

Description:
Effects of industrial wastes on environment, waste minimization techniques: volume and strength reduction - Physical, chemical and biological treatment of industrial sewage, advanced wastewater treatment – manufacturing process, wastewater characteristics and treatment processes of major industries - Effluent standards and legislations, zero discharge concepts - environmental protection act – Air Act – Water Act – Wetland Regulatory Notification and Coastal Zone Regulation.

References:

1. Rao, M.N. and Dutta, "Waste Water Treatment", Oxford and IBH Publishing Ltd. Calcutta, 2008
2. Eckenfelder, W.W., "Industrial Waste Pollution Control", McGraw Hill Book Co., New Delhi 2003
3. Nemerow, N.L., "Theory and Principles of Industrial Waste Treatment", Addison Wesley, Reading Mass, 2003
4. Water Environment Federation., "Industrial Wastewater Management Treatment and Disposal 3E", Mc Graw Hill, 2008
5. Frank Woodard., "Industrial Waste Treatment Handbook", Butterworth-Heinemann, 2001

14CE2039 - SOLID WASTE MANAGEMENT

Credit: 3:0:0

Course Objective:
- To educate the students on the principles involved in the management of municipal solid waste and hazardous wastes – from source identification up to disposal.

Course Outcome:
Students at the end of the course will be able to

- Involved the principles in management of municipal solid waste and hazardous wastes from source identification up to disposal
- Select municipal solid waste collection and treatment methods
- Develop skills to undertake major projects related to municipal solid waste management

Description:
Types and sources of solid waste, integrated waste management, legislations on municipal solid waste, hazardous wastes, biomedical wastes - Composition, physical, chemical and biological properties of solid waste, Source reduction, recycling and reuse - Storage, collection and transport of solid waste, handling of hazardous waste and its transport - Material separation and processing technologies - biological, chemical and thermal conversion and disposal – treatment of biomedical wastes.

References:

1. George Tchobanoglous, Hilary Theisen and Samuel, A. Vigil, "Integrated Solid Waste Management", McGraw- Hill International edition, New York, 2012.
2. "CPHEEO Manual on Municipal Solid waste management", Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.
3. Micheael, D. LaGrega, Philip, L. Buckingham, Jeffrey, C. E., "Environmental Resources Management, Hazardous waste Management", McGraw-Hill International edition, New York, 2001.
4. Vesilind, P.A., Worrell, W and Reinhart, "Solid waste Engineering", Thomson Learning Inc., Singapore, 2002.
5. Jagbir Singh, A. L Ramanathan, "Solid Waste Management Present and future Challenges", IK International, 2010

14CE2040 - ENVIRONMENTAL CHEMISTRY AND MICRO-BIOLOGY

Credit: 3:0:0

Course Objective:

- To educate the students the chemistry of water, air and soil and the microbiology of the environment.

Course Outcome:
Students at the end of the course will be able to

- Assess the chemical reactions in the atmosphere
- List the micro-organisms in air, water and soil
- Analyse the reduction and sorption in aquatic environment

Description:
Chemical reactions, Chemical equilibrium and thermodynamics, Instrumental methods - chromatographic and spectroscopic techniques - Complex formation, oxidation, reduction and sorption in aquatic environment - Chemical and photochemical reactions in the atmosphere, photochemical smog, green house gases and global warming - Distribution of microorganisms in water, air and soil, indicator organisms, metabolism of microorganisms, isolation of microorganisms.

References:

1. Sawyer C.N, MacCarty P.L and Parkin G.F, "Chemistry for Environmental Engineering and Science", Tata McGraw-Hill, Fifth edition, New Delhi, 2002
2. Vanloon G.W and Duffy S.J "Environmental chemistry – a global perspective", Oxford University press, New York., 2000.
3. Pradipta K Mohapatra.,"Environmental Microbology", I K International, 2008
4. Anita Rajor.," Practical Methods for Environmental Microbiology and Biotechnology", Krishna Prakashan Ltd. Meerut, 2002
5. Mehrotra And Sumbali, "Principles of Microbiology", Tata McGraw-Hill Education, 2009

14CE2041 - AIR POLLUTION MANAGEMENT

Credit: 3:0:0

Course Objective:

- To educate the students on various methods of control of particulate and gaseous air pollutants

Course Outcome:

Students at the end of the course will be able to

- Classify different types of pollutants
- Analyse the possibilities of air pollution and control
- Measure the noise and develop the standard's for control

Description:

Sources and classification of pollutants and their effects on human health, vegetation and property, emission standards, atmospheric stability, atmospheric diffusion theories - plume rise – Methods for the control of particulate and gaseous contaminants, operational considerations and monitoring - Process modification for the minimization of automobile pollution, Technical and Economic Feasibility of emerging technologies for air pollution control, indoor air quality, noise measurements and standards – Radioactive pollution and its control.

References:

1. Rao C S, Environmental Pollution Control Engineering, New Age International (p) Limited, 2006.
2. Lawrence K.Wang, Norman C Perelra, Yung-Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004.
3. David H.F Liu, Bela G.Liptak "Air Pollution", Lewis Publishers, 2000.
4. Anjaneyulu.Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd, India, 2002.
5. Mudakavi, J R, "Principles and Practices of Air Pollution Control and Analysis" IK International, 2010

14CE2042 - GLOBAL CLIMATE CHANGE AND ITS IMPACT

Pre-requisite: 14CE2012: Water Resources Engineering

Credit: 3:0:0

Course Objective:

- To appreciate the global climate change scenario, causes and consequences
- To learn about climate change modelling

Course Outcome:

Students at the end of the course will be able to

- List the factors affecting global climate change
- Analyze the impacts of global climate change
- Explain the importance of water

Description:

Concept of Global Climate: cliamte in the spot light- the earth's natural green house effect- Green house gases- vital importance of monsoon rains, clouds, storms and climate- Causes for climate change: Patterns of large-scale variability - Influences and feedbacks of hydrological changes on climate- Climate Modelling - Potential consequences and impacts of climate change- Water-related adaptation to climate change in the fields of Ecosystems and biodiversity- Agriculture and food security, land use and forestry, Human health, water supply and sanitation, infrastructure and Economy (insurance, tourism, industry and transportation) -Adaptation, vulnerability and sustainable development.

References:

1. Singh, K. P., "Geomorphology and global climate change", 2011.

2. Thomas R Karl , Jerry Melillo., "Global Climate Change Impacts in the United States", U S Global Change Research. 2009
3. Syed M. H., "Climate Change". Daya Publishing House, 2009
4. Syed M.H, Encyclopaedia of SAARC Nations, Gyan Publishing House, 2003
5. Alper Baba, Gökmen Tayfur, "Climate Change and Its Effects on Water Resources" Springer Publishers, 2010

14CE2043 - DISASTER MANAGEMENT AND MITIGATION

Credit: 3:0:0

Course Objective:

- To expose the students to the natural and manmade disasters
- To train the students to study the effect of disasters and methods to mitigate disasters.

Course Outcome:

Students at the end of the course will be able to

- Students exposed to the natural and manmade disasters
- Develop the mitigate methods for various disasters
- Adopt the disaster management strategies.

Description:

Types and effects of natural disasters, climate change: sea level rise and global warming, ozone layer depletion - Types of man-made disasters, effects on the environment, types of accidents - Mitigation of natural disaster, national disaster management framework, financial arrangements, community based organizations, role of central, state, district and armed forces in disaster response, police and other organizations - Skills and strategies for disaster preparedness, reconstruction and rehabilitation, risk-time charts

References

1. Iyengar, C.B.R.I., "Natural Hazards in the Urban Habitat" , Tata McGraw Hill Co., 2001.
2. Jon Ingletone, "Natural Disaster management", Tulor Rose, 1999.
3. Singh, R.B., "Disaster Management", Rawat Publications, 2000.
4. Sachindra Narayan, "Anthropology of Disaster management", Gyan Publishing House, 2000
5. Damon P. Coppola, "Introduction to International Disaster Management", Elsevier Publication, 2011

14CE2044 - ADVANCED ENVIRONMENTAL ENGINEERING LAB

Pre-requisite: 14CE2021: Environmental Engineering Lab

Credit: 0:0:2

Course Objective:

- To give hands-on training on the site as well as laboratory methods of water and wastewater analysis
- To educate the students on the analysis of chemical and biological parameters of water and wastewater

Course Outcome:

Students at the end of the course will be able to

- Estimate the BOD and COD in water samples
- Analyse the chemical properties of water and waste water
- Classify the heavy metals in waste water

Description:

Physical analysis of water and wastewater - Chemical analysis of water and wastewater - Estimation of BOD and COD of wastewater samples - Analysis of heavy metals in water - Bacteriological analysis of water and wastewater

Experiments
The faculty conducting the Laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Sawyer, N.C., and McCarty, P.L., "Chemistry for Environmental Engineering", McGraw-Hill Book Co., New York, 2002.
2. "Standard Methods for the Examination of Water and Wastewater", APHA-AWWAWPCF, Washington (D.C), 2012.

14CE2045 - GIS LAB

Credits: 0:0:1

Course Objectives:
- To give hands-on training on the applications of GIS in the context of water resources

Course Outcome:
Students at the end of the course will be able to
- Analyse the geo spatial maps and related data
- Model geographical information system
- Manage land and water resources

Description
Map processing - Spatial analysis - Assessment of water quality and quantity - land use – land cover changes

Experiments
The faculty conducting the Laboratory will prepare a list of 6 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

References:

1. Lillesand, T. M. and Kiefer, R. W. "Remote Sensing and Image Interpretation"., Third Edition. John Wiley and Sons, New York, Fifth Edition 2003.
2. Basudeb Bhatta. "Remote Sensing and GIS". Oxford University Press. 2nd Edition 2011.
3. Lo C P Yeung, K W Albert, "Concepts and Techniques of GIS", Prentice Hall of India, 2002.
4. Michael N. Demers, "Fundamentals of GIS with Lab Manual Set", John Wiley & Sons, 2000

14CE2046 SMART MATERIALS AND STRUCTURES

Credit: 3:0:0

Course Objective
- To give an in-depth knowledge on properties of smart materials and their use in structures.

Course Outcome
Students at the end of the course will be able to
- Select the smart materials for smart structures
- Apply the smart materials in the construction
- Design the smart structures using smart materials

Description:
Properties of smart materials- mechanisms and properties - fiber optic strain sensors, vibration absorbers- vibration characteristics of mistuned systems strain measuring techniques control systems: classical control, modern control, optimal control and digital control - active structures in practice, Application of smart materials in bridges, high rise structures – structural health monitoring - concept of smart concrete.

References

1. Srinivasan, A.V., and Michael McFarland. D., "Smart Structures – Analysis and Design", Cambridge University Press, 2001.
2. Brian Culshaw, "Smart Structures and Materials", Artech House, Boston, 1996.
3. Donald J. Leo, "Engineering Analysis of Smart Material Systems" John Wiley & Sons. 2007
4. Hartmut Janocha, "Adaptronics and Smart Structures: Basics, Materials, Design, and Applications", Springer, 2007
5. Brebbia C. A, Samartin A., "Computational methods for smart structures and materials - II", WIT Press/Computational Mechanics Publications, 2000

14CE3001 APPLIED ELASTICITY AND PLASTICITY

Credit: 3:0:0

Course Objective

- To study the stress and strain analysis of 2D and 3D problems and torsion
- To have a brief introduction to failure criteria and elasto-plastic problems of beams in bending, pressure vessels and torsion

Course Outcome

At the end of the course student will be able to

- apply the concept of advanced structural mechanics in real time structures

Description:

Analysis of stress and strain in three dimensional cartesian coordinates, generalized Hook's law, formulation of elasticity problems, two dimensional problems in rectangular and polar co-ordinates,torsion of non-prismatic bars and thin walled open and closed sections**,** Yield criteria, elasto–plastic problems –Beams in bending, cylinders subjected to internal pressure and torsion of bars.

References:

1. Sadhu Singh., "Theory of Elasticity", Khanna Publishers, N.Delhi, 2013.
2. Sadhu Singh., "Theory of Plasticity and Metal forming", Khanna Publishers, New Delhi, 1999.
3. Timoshenko, S and James M Gere, "Theory of Elasticity Stability", Dover Publication, 2009.
4. Chakrabarthy, J., "Theory of Plasticity", BH publishers, 2006.

14CE3002 ADVANCED CONCRETE TECHNOLOGY

Credit: 3:0:0

Course Objective:

- To study about the constituents of concrete
- To study the properties of fresh and hardened concrete
- To apply new theories and testing techniques

Course Outcome:

At the end of the course the students will be able to

- understand the behaviour of the concrete
- carry out the mix design by various methods and for special concrete

Description:

Concrete- Constituents: cement, fine aggregates and coarse aggregates, - use of various additives, production techniques and chemical processes, degree of control over the properties of specific concretes for a wide range of applications - New theories, models and testing techniques, Fracture mechanics of hardened concrete, advanced

cementitious composites, production of durable, economical and sustainable concrete – Non destructive testing of concrete

References:

1. John Newman, B S Choo,. "Advanced Concrete Technology 2: Concrete Properties", Butterworth-Heinemann. 2003
2. Murari Lal Gambhir, "Concrete Technology: Theory and Practice" Tata McGraw-Hill Education. , 2013
3. Nayak N. V., Jain A. K., "Handbook on Advanced Concrete Technology", Alpha Science International, Limited, 2012
4. Zongjin Li. "Advanced Concrete Technology", John Wiley & Sons. 2011

14CE3003 STRUCTURAL OPTIMIZATION

Credits: 3:0:0

Course Objective

- To enable the student to understand the concept of optimization
- To enable them apply optimization concept to different civil engineering problems

Course Outcome

At the end of the course student will be able to

- carry out cost optimization of structures using different methods
- apply the knowledge in designing real time problems

Description:

Concepts of minimum weight - minimum cost design, constrained and unconstrained optimization techniques, linear and non-linear programming- simplex algorithm, geometric programming, dynamic programming, Non-conventional optimization techniques-genetic algorithm, ant colony algorithm, artificial neural networks, fuzzy logic in civil engineering. Optimal design of beams, frames and trusses.

References:

1. Rao, S.S., "Engineering Optimization, Theory and Practice", New Age International (p) Ltd., New Delhi, 2002.
2. David. W. A Rees., "Mechanics of Optimal Structural Design: Minimum Weight Structures", John Wiley and Sons, 2009
3. Rajasekaran,S. and Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and GeneticAlgorithm", Prentice Hall of India Pvt. Ltd, Delhi, 2003.
4. Kalyanmoy Deb., "Multi-Objective Optimization using Evolutionary Algorithm", John Wiley and Sons, 2001.

14CE3004 ADVANCED DESIGN OF REINFORCED CONCRETE STRUCTURES

Credit: 3:0:0

Course Objective:

- To understand the behavior of structural elements
- To study the design of special structures

Course Outcome:

At the end of the course student will be able to

- apply knowledge to analyse and design statically indeterminate structures

Description:

Limit State Design of Beams for Shear, Torsion and Bond - Composite column and Tubular column - Design of Bunkers and Silos - design of RCC chimney - cooling tower and nuclear structures - Limit Analysis and Design of

isotropically and orthotropically reinforced slabs of various shapes - Design of flat slabs, Limit Analysis and Design of Statically Indeterminate Structures - Check on rotation capacity - Grid floors - Shells and folded plates of simple configuration.

References:

1. Bhavikatti S.S, "Advanced RCC Design", New age International Pvt. Ltd. 2006.
2. Varghese, P.C., "Advanced Reinforced concrete structures ", Prentice – Hall of India Ltd, New Delhi 2003.
3. Krishnaraju,N., "Advanced Reinforced Concrete Design", CBS publications, New Delhi 2005.
4. Punmia B.C "Advanced RCC Design", Laxmi Publications Pvt Ltd", 2006.
5. James K. Wright, James Grierson MacGregor, "Reinforced Concrete: Mechanics and Design (4th Edition), Pearson Education Limited, 2012

14CE3005 STRUCTURAL DYNAMICS

Credit: 3:0:0

Course Objective

- To impart knowledge free and forced vibration SDOF, MDOF and distributed parameter

Course Outcome

At the end of the course student will be able to

- carry out vibration studies and their importance to structural engineering problems
- analyze multi storied buildings subjected to dynamic loads

Description:

Principles of dynamics, single degree of freedom- damped and undamped free and forced vibration – transmissibility - response to general dynamic loading (blast or earthquake), two degrees of freedom systems, normal modes of vibration –vibration absorber, mathematical modeling of multiple degree of freedom system- shear building,free vibration of undamped system- orthogonality of normal modes, solution of eigen value problem, distributed parameter system, solution for equilibrium equations in dynamics

References:

1. Clough, R.,W., and Penzien, "Dynamics of Structures", McGraw Hill Book Co Ltd, 1986.
2. Paz Mario, "Structural Dynamics - Theory and Computation", CBS publishers, US, 1999.
3. Anil K. Chopra, "Dynamics of Structures" (4th Edition), Prentice Hall; 2011
4. Roy R. Craig, Andrew J. Kurdila., "Fundamentals Structural Dynamics ", John Wiley and Sons, UK, 2011.
5. Thomson, W.T., "Theory of Vibrations with applications", Prentice Hall of India, 2008.
6. Humar J. "Dynamics of Structures", Third Edition, CRC Press, 2012

14CE3006 FINITE ELEMENT METHODS IN ENGINEERING

Credit: 3:0:0

Course Objective

- To understand the basic concept of finite element for one, two, and three dimensional finite elements
- To study the various finite element procedures and solution techniques for linear and nonlinear structures.

Course Outcome

At the end of the course student will be able to

- analyze the discrete and continuum problems using finite element method.

Description

Concept of finite element - variational and weighted residual methods - convergence and compatibility requirements - elements for trusses - beams and frames - stress and strain analysis of two dimensional planar problems - concept of shape functions - triangular elements - rectangular elements - iso-parametric elements stress

analysis (three dimensional elements): numerical integration techniques plate and shell elements - finite strip method nonlinear - vibration and thermal problems, meshing and solution problems - auto and adaptive mesh generation techniques .

References:

1. Robert D.Cook, e tal, " Concepts and Applications of Finite Element Analysis", John Wiley & Sons, Inc. Singapore, 2007
2. Bathe. K.J., "Finite Element Procedure", Prentice Hall of India, New Delhi, 2006.
3. Zienkiewicz O. C., Robert Leroy Taylor., "The Finite Element Method Vol. 1 & 2", McGraw Hill Book Company, New York, 2005
4. Tirupathi, R.Chandrupatla and Ashok, D. Belegundu., "Introduction to Finite Elements in Engineering", Prentice Hall of India Private Limited., New Delhi, 2004.
5. Rajasekaran, S., "Finite Element Methods in Engineering Design", S.Chand& Co Ltd., NewDelhi, 2003.
5. Mukhopadhyay, M., "Matrix, Finite Element Computer and Structural Analysis", Oxford & IBH publishing Co., Pvt. Ltd. New Delhi, 1993.

14CE3007 SEISMIC DESIGN OF STRUCTURES

Credit: 3:0:0

Course Objective

- To introduce about the seismology
- To introduce the concepts of seismic design of buildings

Course Outcome:

At the end of the course the student will be able to

- analyse and detail buildings for seismic resistance
- apply knowledge to strengthen the existing buildings

Description:

Engineering seismology - lessons learnt from past earthquakes - conceptual design considerations - seismic methods of analysis - lateral load analysis using codal provisions - principles of earthquake resistant design - ductility consideration of earthquake design of RC buildings - capacity based design, behavior and design of shear wall in earthquake - seismic design of masonry buildings - seismic behaviour of steel structures - design of steel structures - response control concepts, methods of retrofitting.

References:

1. Pankaj Agarwal and Manish Shrinkhande., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd., New Delhi, 2007.
2. Duggal, S.K., "Earthquake Resistant Design of Structures", Oxford University Press, New Delhi, 2007.
3. Chopra, A.K., "Dynamics of Structures - Theory and Applications to Earthquake Engineering", Prentice Hall of India private limited, New Delhi, 2002.
4. Steven, L.Kramer., "Geotechnical Earthquake Engineering", Prentice Hall of India Pvt Ltd., New Delhi, 2004.
5. Naeim, F., "The Seismic Design Hand Book", 2nd Edition, Kluwer academic publishers, London, 2001.

14CE3008 EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION

Credit: 3:0:0

Course Objective:

- To study the various techniques for experimentation
- To study the Modeling of different structures
- To understand the various non destructive tests

Course Outcome:
At the end of the course student will be able to

- Apply the knowledge to various experiments
- Model complex structures for static and dynamic load
- Analyze the distress in structures

Description:
Forces and strain measurement, principles and operation - vibration measurements - velocity and acceleration measurements - digital data acquisition systems, acoustics and wind flow measurement - structural modeling - Model analysis for concrete structures - wind tunnel, load tests on actual structures - bridges and dams - distress measurements and control tests on beams and structures - non-destructive testing methods.

References:

1. Arthur P. Boresi, Ken Chong, James D. Lee "Elasticity in Engineering Mechanics", John Wiley & Sons. 2012
2. Dalley, J.W and Riley, W.F, "Experimental Stress Analysis", Mc Graw Hill Book Company, New York, 2004
3. GanesanT.P., "Model Analysis of Structures", University Press, India, 2005.
4. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 1996.
5. William N. Sharpe, Jr., William N. Sharpe, "Springer Handbook of Experimental Solid Mechanics", Springer, 2008

14CE3009 ADVANCED DESIGN OF METAL STRUCTURES

Credit: 3:0:0

Course Objective:

- To study the design of framed connections, pre-engineered buildings and towers and chimneys.
- To understand the behaviour of composite members and design

Course outcomes:
At the end of the course student will be able to

- apply the codal provisions for the design of steel structural elements
- design the components of pre-engineered buildings
- design the composite structural members

Description:
Design for simple and moment resistant connections- welded and bolted seat connections, Limit state design of Beams and Beam columns, lateral torsional buckling, modes of failure, Design of Industrial steel buildings, pre-engineered buildings, Wind load analysis and Design of Towers and Stacks, Design of light gauge steel sections**,** Concepts of Plastic analysis, continuous beams and portal frames.

References:

1. N. Subramanian N, "Design of Steel Structures", Oxford University Press, USA, 2008
2. Dayaratnam, P., "Design of Steel Structures", A.H.Wheeler& Co. Ltd., Allahabad, 2008
3. Arya and Ajmani, "Design of Steel Structures", NemChand Brothers, Roorkee, 2007
4. Punmia B.C., Ashok kumar Jain and Arunkumar Jain, `Design of Steel Structures', ArihantPublications, Bombay, 2008
5. Gray, C. S. Kent L.E Mitchell, W.A., and Godfey, W.B., "Steel Designer's manual", English Language Book Society and Granade Publishing, London, 2003
6. Teaching Resource Materials on Steel – SERC, INSDAG, Anna University and IIT Madras

14CE3010 ADVANCED BRIDGE ENGINEERING

Credit: 3:0:0

Course Objectives:

- To get exposed to the design aspects of various types of bridges using IRC specifications and railways
- To learn the concept of design of substructure for the bridges
- To learn the construction and maintenance of bridges

Course Outcome:

At the end of the course the student will be able to

- design various types of bridges and substructures
- carry out the construction and maintenance of buildings

Description

Design of Concrete Bridges-slab, T-beam and- slab – arch - bow string girder types - Prestressed Concrete Bridges - simple spans, continuous decks - Steel Bridges - Plate girder, box girder, truss and arch types - Cable stayed bridges and suspension bridges; principles of design, aerodynamic stability and vibrations - Substructure design: piers and abutments and Foundations - River draining works - Design of bearings - Erection techniques - Bridge maintenance management: inventory, inspection and rehabilitation. Failures – case studies.

References:

1. Johnson Victor, D., "Essentials of Bridge Engineering", Oxford & IBH Publishing Co., New Delhi, Fourth Edition, 2007.
2. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, New Delhi, 2007
3. Krishna Raju, N., "Design of Bridges", Oxford & IBH Publishing Co., New Delhi, Third Edition, 2007.
4. Jagadeesh T.R., Jayaram M.A., "Design of Bridge Structures", Prentice Hall of India Private Limited, New Delhi, 2007.

14CE3011 COMPUTER AIDED DESIGN LABORATORY

Credit: 0:0:1

Course Objective

- To introduce the application of FEM in Software Packages
- To enable the students to analyze and design various structural elements using software packages

Course Outcome

- Student capacitated to analyse and design RCC and steel structures by using software packages

Experiments

The faculty conducting the Laboratory will prepare a list of 6 experiments and get the approval of HoD and notify it at the beginning of the semester.

References:

1. STAAD Pro 2007 V8i Analysis Reference Manual.
2. ANSYS 11.0 Analysis Reference Manual.
3. SAP Analysis Reference Manual – "Computers and structures".
4. Rudra Pratap, "Getting Started with MATLAB", Oxford University Press, 2002

14CE3012 ADVANCED STRUCTURAL TESTING LABORATORY

Credit: 0:0:2

Course Objective

- To impart basic knowledge on properties of building materials

- To impart knowledge on concrete mix design for low strength and high strength concrete
- To study the behaviour of fresh and hardened concrete, high performance concrete
- To impart knowledge on non-destructive testing

Course Outcome
At the end of the course student will be able to
- identify the suitable materials needed for concreting
- understood the behaviour of concrete for different types of loading

Experiments:
The faculty conducting the Laboratory will prepare a list of 12 experiments on static and dynamic loading tests and get the approval of HoD and notify it at the beginning of the semester.

References:

1. Neville, A.M., "Concrete Technology", Longman Scientific & Technical, England, 2008.
2. Gambir, M.L., "Concrete Technology", Tata McGraw Hill, New Delhi, 2004.
3. Shetty, M.S., "Concrete Technology", S. Chand & Co., New Delhi, 2005.
4. Krishnaraju, N., "Design of concrete mixes", Sehgal Educational Consultants & Publishers Pvt.Ltd., Faridabad, 2007.

14CE3013 DESIGN OF STRUCTURES FOR DYNAMIC LOAD

Credit: 3:0:0

Course Objective
- To study the basic principles of dynamic loads
- To study the behaviour of structures subjected to dynamic loads

Course Outcome
At the end of the course student will be able to
- carry out analysis and design of various tall buildings and other structures subjected to various dynamic loads.

Description:
Dynamic loads - behavior under impact and cyclic loads: concrete, steel, masonry and soil – design against earthquakes: hydraulic structures, life line structures, terminal buildings, towers, tunnels - Inelastic earthquake analysis of multi-storey building frames, Pushover Analysis, Design against blast and impact - design against wind and cyclone– aero elastic and aerodynamic effect - design as per BIS code of practice including gust factor approach – tall buildings, stacks and chimneys - Passive and active control of vibrations - new and favorable materials - Stability of nonlinear and time varying Systems - Inverse problems in vibrations: System identification approaches.

References:

1. Paulay,T and Priestly, M.N.J "Aseismic Design of Reinforced Concrete and Masonry Buildings", John Wiley and Sons, 1991.
2. Alan G. Daven Port, "Wind Effects on Buildings and Structures", Proceedings of the Jubileum Conference on Wind effects on Structures, Port Alegne, Brazil, pp 25-29, Balkema A.A. Publishers, 1998.
3. Virdi K. S., Matthews R, Clarke J. L, Fikry Garas, "Abnormal Loading on Structures: Experimental and Numerical Modelling", CRC Press. 2000
4. Theodor Krauthammer, "Modern Protective Structures", CRC Press. 2008
5. Graham, M.L. Gladwell, "Inverse Problems in Vibration", Springer Verlag. 2004
6. Datta T. K, "Seismic Analysis of Structures", John Wiley & Sons (Asia). 2010

14CE3014 DESIGN OF SPACE STRUCTURES

Credits 3:0:0

Course Objective

- To understand the concept of space structures
- To understand the behaviour of space structures

Course Outcome

At the end of the course student will be able to

- design the space structures

Description:

Space structures - Single and multi-layer grids - Barrel vaults – Domes - Towers - Tension structures - Pneumatic structures - Material- Protection coats for the members - Practical construction methods – Drainage - Transportation problem - Lifting technique - corrosion protection - Maintenance and fire protection - forms of space structures - Tensegrity frame work – Tensile structures - Pneumatic structures Prefabricated Space Structural Systems**:** Mero, Space deck, Nodus, Unistrut, Triodetic, Unibat and NS truss - Node Connectors: Mero - Octatube - Nodus system – Triodetic - Modular system – Tomo unit truss. Finite element method - Linear – Nonlinear - Collapse - Dynamic and Stability analysis - Design of Members**:** Joints - Support systems – Foundations. Configuration Processing: Formian Algebra - case studies - Failures.

References:

1. Ramaswamy G. S, Mick Eekhout,Suresh G. R, "Analysis, Design and Construction of Steel Space Frames", Thomas Telford 2002
2. Subramanian,N. "Space Structures: principles and Practice I" Multi Science Publishing Company 2006.
3. S. Woinowsky-Kriege, "Theory of plates and shells", Mc Graw Hill 2003.
4. Reinhold Kienzler, Holm Altenbach, Ingrid Ott "Theories of Plates and Shells: Critical Review and New Applications", Springer 2013

14CE3015 DESIGN OF TALL BUILDINGS

Credit: 3:0:0

Course Objective

- To provide an insight into the techniques for the analysis of tall buildings.

Course Outcome

At the end of the course the student will be able to

- perform linear and non-linear and stability analysis of tall buildings.

Description:

Design principles and loading: methods of live load reduction - Behaviour of various structural systems: factors affecting growth, height and structural form - high rise behavior: rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, outrigger braced and hybrid mega systems, modeling for approximate analysis , computerized general three dimensional analysis, stability of tall buildings, p-delta analysis

References:

1. Bungale S Taranath, "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2011.
2. Bungale S. Taranath, "Reinforced Concrete Design of Tall Buildings", CRC Press, 2009
3. Bungale S. Taranth , "Wind and Earthquake Resistant Buildings: Structural Analysis and Design", CRC Press, 2005
4. Guy Nordenson, "Tall Buildings", Museum of Modern Art. , Delhi, 2003.
5. Mark P Sarkisian, "Designing Tall Buildings: Structure as Architecture", Routledge, 2012.

14CE3016 DESIGN OF OFFSHORE STRUCTURES

Credit: 3:0:0

Course Objective

- To learn the theories on wave motion
- To understand the behavior and design aspects of offshore structures

Course Outcome

At the end of the course the student will be able to

- analyze and design offshore structures

Description:

Theories of periodic wave motion - mathematical formulation of wave problem - forces due to ocean waves on structures: wave forces on breakwaters and sea walls due to non-breaking and broken waves - wave forces on piles. Shore protection works: natural and artificial, design of breakwaters, Functional aspects and design of piers, wharf , quay walls, gravity dry docks - floating dry docks - dolphins - fenders - offshore mooring buoys - offshore marine platform.

References:

1. Mohamed A. El-Reedy, "Offshore Structures: Design, Construction and Maintenance Gulf Professional Publishing, 2012
2. Gudmestad O.T, Holand I., Jersin E., "Design of Offshore Concrete Structures", CRC Press. 2002
3. Ben C. Gerwick, Jr, "Construction of Marine and Offshore Structures, Third Edition, CRC Press, 2007
4. API Recommended Practice, "Planning, Designing and Constructing Fixed Offshore Platforms", American Petroleum Institute Publication, RPZA, Dallas, 1999.

14CE3017 GEOTECHNICAL EARTHQUAKE ENGINEERING

Pre-requisite: 14CE3007 Seismic Design of Structures

Credit: 3:0:0

Course Objective:

- To provide fundamental knowledge of soil-dynamics and seismic behavior of soils.

Course Outcome:

At the end of the course the student will be able to

- apply the concept of soil dynamics for seismic design

Description:

Wave Propagation, Attenuation of stress waves – Dispersion - waves in a layered medium - Static and dynamic characteristics of soils - Ground Response Analysis: Equivalent and nonlinear finite element approaches - soil-structure interaction – Liquefaction - Earth Pressure: Active and passive earth pressures; Terzaghi's passive wedge theory, numerical methods, earth pressure measurements.; Seismic design of retaining walls - Types of earthquake induced landslides - Evaluation of slope stability - Ground Improvement Techniques - Applications.

References:

1. Prasad Bharat Bhushan, "Advanced Soil Dynamics and Earthquake Engineering", PHI Learning Pvt. Ltd. 2011
2. Ranjan, G. and Rao A.S.R., "Basic and Applied Soil Mechanics", New AgeInt. Ltd., 2000
3. Kameshwara, Rao, N.S.V, "Dynamic Soil Tests & Applications", Wheeler Publications, 2000
4. Day Robert, W., "Geotechnical Earthquake Engineering Handbook", McGraw-Hill, 2001
5. Kramer, S.L., "Geotechnical-Earthquake Engineering", Pearson Education, 2004
6. Saran, S. "Soil Dynamics & Machine Foundation", Galgotia Publication, 2006

14CE3018 DESIGN OF SUBSTRUCTURES

Credit: 3:0:0

Course Objective:

- To study the design of various types of foundation.

Course Outcome:

At the end of the course the student will be able to

- carry out soil investigation and selection of foundation
- design various types of foundations.

Description:

Soil Investigation and Selection of foundation - Design of reinforced concrete isolated, strip, combined and strap footings – mat foundation, pile foundations , pile load test – structural design of straight piles, structural design of pile cap - Types and design of well foundation – lateral stability - principles of design of machine foundation design for reciprocating machines and impact machines, vibration isolation - Foundation on expansive soils, under-reamed pile foundation - foundation for concrete towers, chimneys, anchors- reinforced earth retaining walls.

References:

1. Swamy Saran, "Analysis and Design of substructures", Oxford and IBH Publishing Co. Pvt. Ltd., 2006.
2. Varghese.P.C, "Design of Reinforced Concrete Foundations" – PHI learning private limited, New Delhi – 2009
3. Tomlinson.M.J, "Foundation Design and Construction", Longman, Sixth Edition, New Delhi, 2001.
4. Kameswara Rao N. S. V., "Foundation Design: Theory and Practice", John Wiley & Sons, 2010

14CE3019 DESIGN OF COMPOSITE STRUCTURES

Credit: 3:0:0

Course Objective

- To understand the behaviour of steel concrete composite structures
- To design composite elements and structures and their connections

Course Outcome

At the end of the course the student will be able to

- design steel concrete composite beams, columns, trusses with connection details

Description:

Steel - concrete composite construction -IS, BS and Euro code provisions, elastic and ultimate load behavior, Design of simply supported and continuous steel – concrete composite beams with solid deck slabs and profiled deck slabs - Design of composite trusses and columns - Design of Connections, typical shear connectors and interaction with concrete, Seismic behaviour of composite structures – case studies on steel-concrete composite construction in buildings and bridges

References

1. Johnson, R.P., "Composite Structures of Steel and Concrete", Blackwell Scientific Publications, UK, 2008.
2. Narayanan R., "Steel-Concrete Composite Structures", CRC Press. 2005
3. Alain Nussbaumer, Luis Borges, Laurence Davaine, "Fatigue Design of Steel and Composite Structures: Eurocode 3: Design of steel structures", John Wiley & Sons. 2012
4. INSDAG, "Design of Composite Truss for Building", Institute for Steel Development and Growth Publishers, Calcutta.
5. IS: 11384-1985., "Code of Practice for Composite Construction in Structural Steel and Concrete", Bureau of Indian Standards, New Delhi.
6. Appropriate IS, British and Euro Codes.

14CE3020 STABILITY OF STRUCTURES

Credit: 3:0:0

Course Objective

- To understand the basic principles of stability
- To understand the buckling behaviour of columns, plates and shells

Course Outcome

At the end of the course the student will be able to

- apply the principles of stability for civil engineering structures

Description:

Concept of stability, stability criteria, static and dynamic approach stability of columns - large deflection of columns, effect of shear on buckling, Inelastic buckling theories, beam columns: stability of frames, stability functions, lateral stability of beams, buckling of thin-walled open sections, stability of plates, post-buckling strength, buckling of shells, Donnel's equation, sensitive and insensitive systems - symmetric and asymmetric bifurcation

References:

1. Stephen P. Timoshenko, James M. Gere., "Theory of Elastic Stability", 2nd Ed. McGraw-Hill, 2012.
2. Iyengar, N.G.R., "Elastic Stability of Structural Elements", Macmillan India Ltd., New Delhi, 2007
3. Murali, L. Gambir, "Stability Analysis and Design of Structures", Springer-Verlog, Berlin, 2004.
4. Robert Millard Jones, "Buckling of Bars, Plates and Shells", Mc Graw Hill, 2006.
5. George J. Simitses, Dewey H. Hodges, "Fundamentals of Structural Stability", Butterworth-Heinemann. 2006
6. Chen W.F., Lui E.M, "Principles of Structural Design" CRC Press, 2005
7. Iyengar NGR, "Elastic Stability of Structural Elements", Macmillan, 2007

14CE3021 PRESTRESSED CONCRETE STRUCTURES

Credit: 3:0:0

Course Objective

- To understand the concepts of prestressing concrete structures and the design of various structural components.

Course Outcome

At the end of the course the student will be able to

- analyse and design prestressed concrete structures

Description:

Prestressing systems - Analysis of prestress and bending stresses, concept of load balancing - losses of prestress, deflection, design for flexure, shear and torsion, combined bending, torsion and transverse shear - composite construction of prestressed and in-situ concrete, concordant cables - analysis and design of continuous beam - Circular prestressing - partial prestressing - non-prestressed reinforcement.

References

1. Krishna Raju, N., "Prestressed Concrete", 4th Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007.
2. Rajagopalan.N, "Prestressed Concrete", Narosa Publications, New Delhi, 2008.
3. Perumalsamy Balaguru, Antonio Nanni, James Giancaspro, "FRP Composites for Reinforced and Prestressed Concrete Structures: A Guide to fundamentals and design for repair and retrofit", CRC Press. 2008
4. Loo/Chowdhury, "Reinforced and Prestressed Concrete: Analysis and Design with Emphasis on application of AS 3600 – 2009", Cambridge University Press., 2010
5. Rajagopalan N, "Prestressed Concrete", CRC Press. 2002

14CE3022 INDUSTRIAL STRUCTURES

Credit: 3:0:0

Course Objective

- To provide an insight to the techniques for the analysis and design of industrial buildings

Course Outcome

At the end of the course the student will be able to

- perform the analysis and design of industrial buildings

Description:

Functional Requirements of industrial buildings, Design and detailing of R.C. gable frames, corbels, bunkers, silos and chimneys - North light roofs - Cooling towers -Application of prefabrication techniques, gantry girders, steel bunkers, silos and chimneys - High pressure boilers and piping design. Design of nuclear containment structures, power transmission structures: cables, transmission line towers - Substation structures - Tower foundations – Design of machine foundations.

References

1. Mohamed A. El-Reedy, "Construction Management and Design of Industrial Concrete and Steel Structures", CRC Press, 2010
2. Bhavikatti S.S, "Design of Steel Structures" (By Limit State Method As Per Is: 800 2007), I. K. International Pvt Ltd, 2009
3. Sp32: 1986 - Handbook on "Fundamental Requirements of Industrial Buildings (Lighting and Ventilation)", BIS.
4. Dayaratnam, P., "Design of Steel Structures", A.H. Wheeler & Co., Ltd., Allahabad, 1999.
5. Duggal, "Design of Steel Structure" - 3E, Tata McGraw-Hill Education., 2009
6. Somerville G., "The Design Life of Structures", CRC Press.2003

14CE3023 ADVANCED DESIGN OF PREFABRICATED STRUCTURES

Credit: 3:0:0

Course Objective

- To know the prefabrication technique of various structural components

Course Outcome

At the end of the course the student will be able to

- design various Prefabricated buildings

Description:

Principles of prefabrication - Transportation, Erection - Analysis and design of prefabricated floors, stairs, roofs and joints, walls: leak prevention - joint sealant and sandwich wall panels - materials, erection and joining techniques used in precast construction, design for handling and erection stresses - prefabricated roof for industrial sheds - precast roof trusses, roof panels, crane-gantry girders, corbels, columns and wind bracing - joints between columns and foundations

References

1. Maurice Levitt, "Precast Concrete: Materials, Manufacture, Properties and Usage", Taylor and Francis Group, 2007.
2. Lasslo Mokk, "Prefabricated concrete for Industrial and Public sectors", Akademiai Kiado, Budapest, 2004.
3. "Seismic Design of Precast Concrete Building Structures: State-of-art Report", edited by International Federation for Structural Concrete, FIB - Féd. Int. du Béton. 2003
4. Kim Elliott, "Prefabricated concrete structures", Butterworth-Heinemann, 2002.

14CE3024 ANALYSIS AND DESIGN OF PLATES AND SHELLS

Credit : 3:0:0

Course Objective

- To enable the student to understand the structural behavior of plates and shells
- To enable the student to analyze and design different types of shells and folded plates

Course Outcome

- Student enabled to analyze and design shells and folded plate roofs

Description:

Classical theory of plates - levy and naviers solution of plates - small deflection theory of plates -analysis of laterally loaded (concentrically loaded) plates: circular thin plates with simply supported or clamped edges - Design of folded plate roof, design of shells: spherical shell, conical shell, paraboloid - ellipsoid. R.C. Cylindrical shell, prestressed Cylindrical shells, hyperbolic paraboloid shell, design of R C north-light shells

References

1. S. Woinowsky-Kriege "Theory of plates and shells", Mc Graw Hill 2003.
2. Reinhold Kienzler, Holm Altenbach, Ingrid Ott "Theories of Plates and Shells: Critical Review and New Applications", Springer 2013
3. Farshad M, "Design and Analysis of Shell Structures" Springer 2010
4. "Design of Cylindrical concrete shell roofs", Manual of Engineering Practice No.31 ASCE, New York, 1952.
5. Varghese PC, "Design of Reinforced Concrete Shells and Folded Plates", PHI Learning Pvt Ltd, 2010

14CE3025 ENERGY EFFICIENT BUILDING

Credits: 3:0:0

Course Objective:

- To give the concept of Energy efficient buildings with the holistic approach
- To acquaint the students with the international assessment systems and documentation procedure
- To be aware of the economic benefits of High performance buildings

Course Outcome:

At the end of the course students will be able to

- document and assess the energy efficient building
- Evaluate the economic performance of buildings as related to their resource-consumption and environmental performance.

Description

Energy efficient building concepts and materials - the integrated design process - documentation requirements - Sustainable sites and landscaping- Indoor environment quality – building water and waste management - Green building implementation and assessment (IGBC and LEED standards) of residential building, Industrial building and commercial building – Planning - Site protection- health and safety- waste management - reducing the footprint of construction operations - maximizing the value of building commissioning in HVAC System, lighting and non mechanical Systems - Evaluation of existing buildings and recommendations for improvement- Managing initial costs- cost barrier in project management- long-term environmental benefits.

References

1. Jerry Yudelson, "Green building A to Z, Understanding the Language of Green Building", New Society Publishers, Canada, 2007.
2. Jerry Yudelson, "Green Building through Integrated Design", McGraw Hill, USA, 2009
3. Means, R.S., "Green Building: Project Planning and Cost Estimating", Wiley, Kingston, 2006.

4. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", 2nd Edition, Wiley, New Jersey, 2007.
5. Green building guidelines: Meeting the Demand for Low-energy, Resource-Efficient homes. Sustainable Buildings Industry Council, Washington, D.C., 2004.

14CE201 PREFABRICATED STRUCTURES

Credits: 3: 0: 0

Course Objective:

- To study the design of Prefabricated structural components and its joints
- To study the design of prefabricated structures subjected to dynamic forces

Course Outcome:

At the end of this course the student shall be able to appreciate modular construction, industrialized construction and shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements.

Description:

Unit I Introduction

Need for prefabrication – Principles – Materials – Modular coordination – Standardization Systems – Production – Transportation – Erection

Unit II Prefabricated Components

Behaviour of structural components – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

Unit III Design Principles

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

Unit IV Joint in Structural Members

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

Unit V Design for Abnormal Loads

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, explosions, fire - Importance of avoidance of progressive collapse.

Text books

1. John D. Quale., "Sustainable, Affordable, Prefab: The EcoMOD Project", University of Virginia Press, 2012
2. Koncz T., "Manual of precast concrete construction", Vols. I, II and III, Bauverlag, GMBH, 1971.

Reference Books:

1. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 2012
2. Kim S Elliott, Colin Jolly., "Multi-Storey Precast Concrete Framed structures" Wiley, 2013
3. Colin Davies., "The Prefabricated Home" Reaktion Books, 2005

14CE202 – PRESTRESSED CONCRETE STRUCTURES

Credits: 3:1:0

Course Objective

- To understand the performance of prestressed concrete structures
- To impart knowledge on design of prestressed concrete

Course Outcome

At the end of the course students will be able to

- design prestressed concrete structural members

Description:

Unit I Introduction – Theory and Behaviour

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width

Unit II Design for Flexure and Shear

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per IS1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on IS 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on IS 1343 Code.

Unit III Deflection and Design of Anchorage Zone

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel‟s method, Guyon‟s method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

Unit IV Composite Beams and Continuous Beams

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

Unit V Miscellaneous Structures

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing - merits and demerits of partial prestressing

Text Books

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2008
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2008.

Reference Books

1. Rajagopal, N., “Prestressed Concrete”, 2nd Edn., Narosa Publications, New Delhi, 2007.
2. Lin,T. Y., “Design of Prestressed Concrete Structures”, Asia Publishing House, Bombay, 1995.
3. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
4. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
5. IS 1343-2012, “Prestressed Concrete - Code of Practice”, Bureau of Indian Standards, New Delhi.

14CE203 GIS APPLICATIONS IN CIVIL ENGINEERING

Credits: 4:0:0

Course Objective:

- To introduce the concepts of GIS, Spatial Analysis DEM and DTM
- To impart knowledge on application of GIS for land information system, Civil, water resources management, environmental analysis, Network analysis and urban sprawl analysis

Course Outcome:

At the end of the course, students will be able to

- Students enabled to apply GIS concepts in various aspects of Civil Engineering

Description:
Unit I Introduction: Definition – Map and map analysis, - Coordinate concepts - History and development of GIS – GIS components- - Standard packages.

Unit II Data Entry, Storage and Maintenance:
Type of data - Spatial and non spatial data - Data structure - Points, lines, polygon - Vector and raster - Files, file organization – Database - Digitiser, scanner - Dbase files and data formats – Data compression.

Unit III Data Analysis and Modelling: Spatial Analysis - Data retrieval - Query, simple analysis - Recode, overlay - Vector data analysis, raster data analysis - Modelling in GIS - Digital Elevation Model – DTM - Artificial intelligence.

Unit IV Data Output and Analysis: Types of output data - Display on screen, printer and other output devices - Sources of errors - Types of errors - Elimination, accuracies

Unit V GIS Applications: Application - Civil engineering – transportation engineering - Environmental analysis - Network analysis - Remote sensing applications – software – ArcGIS, QGIS - introduction.

Text Books:
1. Thomas M. Lillisand, "Remote Sensing and Image Interpretation", Wiley India (p) Ltd., 2007.
2. Peter, A. Burrough, "Principle of Geographical Information System" ,Oxford University Press, 2000

Reference Books:
1. Ian Heywood, "An introduction to Geographical Information systems", Pearson Education Limited, 2003.
2. M.Anji Reddy, "Textbook of Remote Sensing and Geographical Information Systems", BS Publications, 2001.

14CE204 GIS LAB

Credit 0:0:1

Course Objective:
- To introduce the application of GIS

Course Outcome:
At the end of the course students will be able to
- apply GIS in various fields of engineering

Experiments
The faculty conducting the Laboratory will prepare a list of 6 experiments and get the approval of HoD/Director and notify it at the beginning of the semester.

Reference Books:
1. GIS lab manual

14CE205 PROGRAMMING USING MATLAB

Credit 0:0:1

Course Objective:
- To introduce the application of Matlab

Course Outcome:
At the end of the course the students will be able to
- analyse and design RCC and steel structures by using Matlab

Experiments
The faculty conducting the Laboratory will prepare a list of 6 experiments and get the approval of HoD and notify it at the beginning of the semester.

References Books:
1. Matlab manual

LIST OF SUBJECTS

Sub. Code	Program Core –36 credits, a full and a Part Semester project Name of the Subject	Credits
14CE3049	Computational Techniques in Transportation Engineering	3:0:0
14CE3050	Intelligent Transportation Systems	3:0:0
14CE3051	Principles of Highway Traffic	3:0:0
14CE3052	Urban Transportation Infrastructure Planning and Design	3:0:0
15CE2001	Irrigation Engineering	3:0:0
15CE2002	Watershed Management	3:0:0
15CE2003	Introduction to Water Quality Analysis and Modeling	3:0:0
15CE3001	Statistical Methods for Engineers	3:0:0
15CE3002	Building Bye laws	3:0:0
15CE3003	Construction Equipment	3:0:0
15CE3004	Project Formulation and Appraisal	3:0:0
15CE3005	Quantitative Techniques in Management	3:0:0
15CE3006	Construction Project Management	3:0:0
15CE3007	Advanced Construction Techniques	3:0:0
15CE3008	Contract Laws and Regulations	3:0:0
15CE3009	Construction Planning, Scheduling and Control	3:0:0
15CE3010	Energy Efficient Buildings	3:0:0
15CE3011	Quality Control lab	0:0:2
15CE3012	Construction Personnel Management	3:0:0
15CE3013	Shoring, Scaffolding and Formwork	3:0:0
15CE3014	Resource Management and Control in Construction	3:0:0
15CE3015	Economics and Finance Management in Construction	3:0:0
15CE3016	Project Safety management	3:0:0
15CE3017	Management Information Systems	3:0:0
15CE3018	Urban Land economics	3:0:0
15CE3019	Principles of Rating and Insurance	3:0:0
15CE3020	Laws for acquisition and contract	3:0:0
15CE3021	Town and regional planning	3:0:0
15CE3022	Valuation of Real Estate	3:0:0
15CE3023	Property laws	3:0:0

	REVISED VERSION SUBJECTS		
Sub. Code	**Version**	**Name of the Subject**	**Credits**
14CE3013	1.1	Design of Structures for Dynamic load	3:0:0
14CE201	--	Prefabricated Structures	3:1:0

14CE3049 - COMPUTATIONAL TECHNIQUES IN TRANSPORTATION ENGINEERING

Credit: 3:0:0

Course Objective:

- Learn to develop mathematical models of phenomena involved in transportation engineering

Course Outcome:

At the end of the course student will be able to

- Understand the important physical phenomena from the problem statement
- Develop model equations for the given system
- Demonstrate the model solving ability for various processes/unit operations

Description:

Introduction to systems approach - Typical transportation systems - Mathematical models - Fundamentals of simulation - Monte Carlo method - Continuous and discrete models - Simulation languages - Probability concepts - Random numbers - Pseudo random generators - Arrival patterns - Service time distributions – Manual simulation of simple queuing system Applications of GPSS - Simple queuing problems - Inventory problems - Simulation of ports - Railway platforms and level crossings - Traffic signals - Analysis of simulation results - Model validation - Replication of random conditions - Time series analysis - Genetic Algorithm - Terminology in GA – Strings, Structure, Parameter string - Data Structures – Operators - Algorithm - Fuzzy Logic - Artificial Neural Networks - Topology - Learning Processes - Supervised and unsupervised learning - Least mean square algorithm - Back propagation algorithm - Application in Transportation – Airport Traffic control modelling - Intermodal freight transportation - Artificial intelligence applications

References:

1. Gordon, G., "System Simulation", Prentice-Hall of India, 2005
2. GPSS/PC, User Manual, Minuteman Software, USA, 2005
3. Zurada J.M., "Introduction to artificial neural systems", Jaico Publishers, 2006
4. Kalyanmoy Deb, "Optimization for Engineering Design: Algorithms and Examples" PHI learning Pvt. Ltd., 2009.

14CE3050 - INTELLIGENT TRANSPORTATION SYSTEMS

Credit: 3:0:0

Course Objective:

- To study the concepts of ITS
- To understand the various methods used in different countries

Course Outcome:

At the end of the course student will be able to

- Understand and appreciate the concepts related to ITS technologies
- Design technologies for applications of the field

Description:

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS objectives - Historical background - Benefits of ITS - ITS Data collection techniques – Detectors - Automatic Vehicle Location (AVL) - Automatic Vehicle Identification (AVI) - Geographic Information Systems (GIS) - video data collection - Information management - Traffic Management Centres (TMC) - Vehicle road side communication – Vehicle positioning system - ITS functional areas – Advanced Traffic Management Systems (ATMS) - Advanced Traveler Information Systems (ATIS) - Commercial Vehicle Operations (CVO) - Advanced Vehicle Control Systems (AVCS) - Advanced Public Transportation Systems (APTS) - Advanced Rural Transportation Systems (ARTS) - ITS user needs and services – Travel and Traffic management - Public Transportation Management - Electronic Payment - Commercial Vehicle Operations - Emergency Management - Advanced Vehicle safety systems - Information Management - ITS for Pedestrians - ITS Programs in the world - Overview of ITS implementations in developed countries - ITS in developing countries

References:

1. Kan Paul Chen, John Miles, "Recommendations for World Road Association (PIARC)", ITS Hand Book 2000
2. Sussman J. M., "Perspective on ITS", Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007

14CE3051- PRINCIPLES OF HIGHWAY TRAFFIC

Credit: 3:0:0

Course Objective:

- To learn Principle components and design of highways.

Course Outcome:

At the end of the course student will be able to

- Understand the important elements of traffic engineering
- Learn elements in highway design
- Learn principles and practices in highway

Description:

Road user - vehicle and roadway - vehicle characteristics - IRC standards - Design speed and volume - Highway capacity and level of service - capacity of urban and rural roads – PCU concepts and limitations - road user facilities - parking facilities - cycle tracks and cycle ways – Pedestrian facilities - Traffic volume studies - origin destination studies - speed studies - travel time and delay studies - Parking studies - Accident studies - Alignment - Cross sectional elements - stopping and passing sight distance - horizontal curves - vertical curves - Design problems - Hill roads - Signs and markings - Traffic System Management - Design of at-grade intersections - Principles of design - Channelization - Design of rotaries - Traffic signals - pre-timed and traffic actuated - signal coordination - Design of signal setting - phase diagrams - timing diagram - Signal co-ordination - grade separated intersections - Geometric elements for divided and access controlled highways and expressways - Road furniture - street lighting - Traffic Safety - road safety programmes - Ramp metering - Design of parking - lighting and terminal facilities - Geometric Design - Sight distance requirements - Vehicle cornering - Horizontal and Vertical alignments - Traffic flow and queuing theory

References:

1. ITE Hand Book, “Highway Engineering Hand Book”, Mc Graw – Hill, 2009.
2. AASHTO, “A Policy on Geometric Design of Highway and Streets”.
3. Pignataro L.J., “Traffic Engineering – Theory & Practice”, John Wiley, 2012
4. Salter R. J and Hounsel N. B., “Highway Traffic Analysis and Design”, Macmillan Press Ltd, 2003.
5. Relevant IRC codes.

14CE3052 - URBAN TRANSPORTATION INFRASTRUCTURE PLANNING AND DESIGN

Credit: 3:0:0

Course Objective:

- Design of Intersections, Interchanges, Parking and Terminal Facilities to be provided in an urban area

Course Outcome:

At the end of the course student will be able to

- Understand the important elements in urban transportation
- Design different elements of transportation system

Description:

Basic considerations – simplicity – uniformity – Separation of conflict points – Design Elements – Design speed – Intersection curves – Superelevation for curves at Intersection – Intersection sight distance - capacity and LOS - Design of rotary and signalized intersections - Vehicle actuated signals - Signal co-ordination - Area Traffic Control System (ATCS) - Pedestrian planning at Grade intersections - Design of Grade separators – Principles - Design Criteria – Layout design - GAD preparation – Pedestrian foot over-bridge and subway design – pedestrian planning for Grade separated intersections - parking demand – characteristics – space inventory – Accumulation – duration – turn over index – Design of Multi Storeyed and surface parking facility - Bus Terminus – Design principles – Design elements – Design and case studies of Inter Modal Transfer facilities – Design and case studies of bus and rail terminals - Characteristics of interrupted traffic - Traffic characteristics at un-signalized intersections - Design of signalized intersections capacity and LOS of signalized intersections - Transportation system management - Guidelines for low cost traffic management techniques for urban areas - IRC Specifications - Advanced transit technologies - Bus route network planning and management

References:

1. Robert F Baker, "Hand Book of Highway Engineering", Van Nostrand Reinhold Company, New York, 2003
2. New Jersy, "Transportation and Traffic Engineering Hand Book", Institute of Transportation Engineers, Prentice Hall, INC, 2006
3. Kanna, S.K. and Justo, C.E.G. "Highway Engineering", Nemchand and Brothers, Roorkee, 2002

15CE2001 - IRRIGATION ENGINEERING

Credits: 3:0:0

Course Objectives:

- Impart knowledge about surface and groundwater irrigation methods
- Impart knowledge about irrigation structures

Course Outcome:

At the end of the course, students will be enabled to

- Plan the irrigation project
- Apply the concepts of irrigation methods
- Apply the irrigation management techniques

Description:

Irrigation engineering : definition, need and mode of irrigation, merits and demerits of irrigation; water requirement of crops: FAO methods, irrigation efficiency, crop ratio; Irrigation methods: canal irrigation, lift irrigation, tank irrigation, flooding methods, sprinkler irrigation, drip irrigation; impounding structures : weirs and barrage, percolation ponds, tanks, sluices, dams; crops drainage structures Irrigation water management: water logging and soil salinity, irrigation water losses, optimization of water use, participatory irrigation management, land reclamation; major irrigation projects in India

References:

1. Sharma R.K., "Irrigation Engineering", S. Chand and Co. 2007.
2. Punima B.C. and Pande B.B .Lal. "Irrigation and Water Power Engineering", Laxmi Publishing, New Delhi, 16th Edition 2009.
3. Michael, A.M, "Irrigation Theory and Practice", Vikas Publishing Pvt Ltd, 2nd Edition 2006.
4. Garg, S. K., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 2011.
5. Dilip Kumar Majumdar, "Irrigation Water Management (Principles and Practices)", Prentice Hall of India (P), Ltd, 2008.
6. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, 2000.
7. Sahasrabudhe, S.R., "Irrigation Engineering and Hydraulic Structures", Katson Publishers, 3rd edition, 2011.
8. Allen R G, Pereira L S, Raes D Smith M, "Crop Evapotranspiration – Guidelines for computing crop water requirements" Irrigation and Drainage, FAO, Rome Italy, 1998

15CE2002 -WATERSHED MANAGEMENT

Credit: 3:0:0

Course Objectives:

- Impart knowledge on the characteristics of watershed
- Understand the processes leading to degradation of soil and waterresources and implementation of conservation measures.

Course Outcomes:

At the end of the course, students will be enabled to

- Delineate watershed of a river basin
- Apply the knowledge on water conservation techniques
- Estimate the rainfall runoff using curve number method.

Description:

Introduction to watershed: definition, concepts, objectives and need; characteristics of watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, runoff estimation using curve number method; watershed management: definition, factors affecting watershed management, controlling of soil erosion and soil salinity; estimation of soil loss due to erosion using Universal Soil Loss Equation; watershed delineation; landuse impacts on watershed; types and design of soil and water conservation, water harvesting structures for different types of catchments; rainwater harvesting; soil moisture conservation; check dams; artificial recharge; sustainability concepts.

References:

1. Murthy J V S, "Watershed Management", New Age International Publishers, 2011
2. Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice-Hall of India Pvt. Ltd., New Delhi, 2000.
3. Suresh R., "Soil and Water Conservation Engineering", Standard Publishing Distributors, New Delhi. 2000.
4. Timothy O. Randhir, "Watershed Management: Issues and Approaches", IWA Publishing, 2007
5. Vijay P. Singh, Ram Narayan Yadava, "Watershed Management", Allied Publishers, 2003

15CE2003 – INTRODUCTION TO WATER QUALITY ANALYSIS AND MODELING

Credits 3:0:0

Course Objectives:

- Understand the physical, chemical and biological processes influencing water quality
- Impart knowledge on the potential role of models in water quality management

Course Outcomes:

At the end of the course, students will be enabled to

- understand the instrumental methods
- apply the concepts of modeling in water quality analysis
- analyse the water samples

Description:

Water quality description; various characteristics of water; water quality criteria and standards, Water quality problems associated with excess iron, fluoride, arsenic, hardness, nitrate, heavy metals, pesticides and Ecoli; types of water pollution; classification of pollutants; eutrophication effects and control; instrumental methods of water quality analysis: UV spectrophotometer, flame spectrophotometer, atomic absorption spectrophotometer; Elements of reaction kinetics, spatial and temporal aspects of contaminant transport, transport mechanisms in rivers and streams; introduction to water quality modeling.

References:

1. Steven C.Chapra, "Surface Water Quality Modeling", McGraw-Hill-Companies, Inc., New York, 2008.
2. Manahan S.E, "Environmental Chemistry" (7^{th} Ed), Lewis Publications, Florida, U.S.A, 2000.
3. Stumm, Werner and James J. M, "Aquatic Chemistry, Chemical Equilibria and Rates in Natural Waters", John Wiley and Sons, Inc., 3rd Edition, 2013
4. Sawyer, C.N. and McCarty, P.L., and Parkin, G.F., "Chemistry for Environmental Engineers", 4^{th}Edn. McGraw Hill, New Delhi, 2003
5. Miguel Valcárcel Cases, "Principles of Analytical Chemistry: A Textbook", Springer Science and Business Media, 2000
6. Qasim, Motley, Guang, "Water Works Engineering", Prentice-Hall India, 2006

15CE3001 STATISTICAL METHODS FOR ENGINEERS

Credits: 3:0:0

Course Objectives:

- Understand the concepts of Statistical methods and its applications in Engineering.
- Acquire knowledge on the effect of estimation theory, testing of hypothesis, correlation and regression, randomized design, and multivariate analysis.

Course Outcome:

On completion of this course the students will be able to

- Apply probability and statistical methods in the field of construction management
- Analyze and solve conflict problems
- Design problems with random parameter

Description

Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of moments, Tests based on Normal, t, X^2 and F distributions for testing of means, variance and proportions – Analysis of r x c tables – Goodness of fit. Multiple and Partial Correlation – Method of Least Squares – Plane of Regression – Properties of Residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations – Regression and Partial correlations in terms of lower order co-efficient - Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design, Random vectors and Matrices – Mean vectors and Covariance matrices – Multivariate Normal density and its properties – Principal components: Population principal components – Principal components from standardized variables.

References:

1. Gupta.S.C., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, Eleventh Edition, 2002
2. Freund J.E., Mathematical Statistical", 5th Edition, Prentice Hall of India, 2001.
3. Jay L.Devore, "Probability and statistics for Engineering and the Sciences", 5th Edition, Thomson and Duxbury, Singapore, 2002
4. Murray.R. Spiegeland Larry J.Stephens, "Schaum'sou Tlines- Statistics", Third Edition, Tata McGraw-Hill, 2000
5. R.A. Johnson and C.B. Gupta, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007
6. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Asia, 6th Edition, 2007

15CE3002 BUILDING BYE LAWS

Credits: 3:0:0

Course Objectives:

- Understand the provisions of the act of building byelaws
- Knowledge on the procedure of applying building permit
- Knowledge on the building performance byelaws
- Application of Byelaws in different forms

Course Outcome:

On completion of this course the students will be able to

- Apply the Building Bye laws for planning of buildings
- Function effectively in obtaining sanctions
- Adapt safety measures in construction

Description:

Preamble – Provision of the act – Jurisdiction – Repeal and Saving - Commissioner – corporation – Dwelling Unit – Existing Buildings – Floor Area Ratio – Form – Ground coverage – Height of a building – Land use – Master plan – Period of construction – Plinth – Sanctioned Design and Specification – Sanctioned use – Schedule – Setbacks or Margins - Building permit and Building use permit – Procedure for obtaining a variance - Environmental Management – Pollution control – Structural Safety – Fire prevention and safety – Maintenance and upgradation - Heritage conservation byelaws – General planning byelaws - Schedules and forms

References:

1. Building bye laws of Delhi, 2005

15CE3003 CONSTRUCTION EQUIPMENT

Credits: 3:0:0

Course Objectives:

- Understand the various types of equipments used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors
- Applications of various equipments in construction projects.

Course Outcome:

At the end of this course students will be able to

- Choose suitable equipments for the construction projects.
- Decide the equipments for special projects
- Improve the site performance by effective equipment management.

Description:

Identification – Planning of equipment - Equipment Maintenance and Management in Projects - Cost Control of Equipment - Depreciation Analysis – Replacement Analysis - Safety Management - types of earth work Equipment - Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling, pile driving and erection, Dewatering, Grouting, Demolition - pumps used in Construction - Different Crushers, Feeders and Screening Equipment for aggregate – Handling, Batching, Mixing and pumping Equipment – Equipment for Ready mix concrete, Concrete pouring, Asphalt laying - Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors, Cranes- Industrial Trucks

References:

1. Jha Kumar Neeraj, Kumar Neeraj Jha, "Construction Project Management: Theory and Practice", Pearson Education India. 2011
2. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, McGraw Hill, Singapore, 2006.
3. Douglas D. Gransberg, Calin M. Popescu, Richard Ryan, "Construction Equipment Management for Engineers, Estimators, and Owners", of CRC Press, 2006
4. Robert L. Peurifoy, Cliff Schexnayder, William B. Ledbetter, "Construction Planning, Equipment and Methods", McGraw-Hill Higher Education, 2001
5. Douglas D. Gransberg, Calin M. Popescu, Richard Ryan Construction Equipment Management for Engineers, Estimators, and Owners, CRC Press. 2006
6. Keoki Sears S., Glenn A. Sears, Richard H. Clough Construction Project Management: A Practical Guide to Field Construction", John Wiley and Sons. 2010

15CE3004 PROJECT FORMULATION AND APPRAISAL

Credits: 3:0:0

Course Objectives:

- Understand the formulation, costing of construction projects, appraisal, finance and private sector participation.

Course Outcome:

On completion of this course the students will be able to

- Demonstrate the knowledge of report preparations
- Plan the key Indicators of the project
- Formulate effective technology transfer mechanisms

Description:

Project – Concepts – Capital investments - Generation and Screening of Project Ideas - Project identification - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Project Clearances - Project Cash Flows – Time Value of Money – Cost of Capital - Pay Back Period – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Selection of a Project and Risk Analysis in Practice. Project Financing – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios - Private sector participation in Infrastructure Development Projects - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer

References:

1. Kim H. Pries, Jon M. Quigley, "Total Quality Management for Project Management", CRC Press. 2012
2. Matthias Kipping, Timothy Clark, "The Oxford Handbook of Management Consulting", Oxford University Press, 2012
3. George Ritz, Sidney Levy, "Total Construction Project Management, Second Edition" , McGraw Hill Professional, 2013
4. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi. 2006.
5. Rajendra Mishra, Project Management, Excel Books, 2012
6. Subhash Chandra Das, "Project Management And Control", PHI Learning Pvt. Ltd., 2011

15CE3005 QUANTITATIVE TECHNIQUES IN MANAGEMENT

Credits: 3:0:0

Course Objectives:

- Understand various quantitative methods applied to the elements of management.
- Application Techniques on production management, finance management, decision theory and managerial economics.

Course Outcome:

On completion of this course the students will be able to

- Interpret the path of operations of the project
- Examine the Quality of execution
- Decide on the budget of the projects

Description:

Introduction to Operations Research - Linear Programming – Graphical and Simplex Methods, Duality and Post – Optimality Analysis – Transportation and Assignment Problems -Inventory Control - EOQ - Quantity Discounts - Safety Stock – Replacement Theory – PERT and - CPM – Simulation Models – Quality Control - Working Capital Management – Compound Interest and Present Value methods – Discounted Cash Flow Techniques – Capital Budgeting - Decision Theory– Decision trees – Utility Theory - Cost Concepts – Break-even analysis – Pricing Techniques – Game theory Applications

References:

1. George E. Monahan, " Management Decision Making: Spreadsheet Modeling, Analysis, and Application", Volume 1, Cambridge University Press, 2000
2. Hamdy A.Taha, "Operations Research: An Introduction", Prentice Hall, 2010.
3. Andreas Klose, M. Gracia Speranza, Luk N. Van Wassenhove, "Quantitative Approaches to Distribution Logistics and Supply Chain Management", Springer, 2002
4. Andreas Klose, M. Gracia Speranza, Luk N. Van Wassenhove, "Quantitative Approaches to Distribution Logistics and Supply Chain Management", Springer Science and Business Media, 2002
5. Tang S.L., Irtishad U.Ahmad, Syed M.Ahmed, Ming Lu, Quantitative Technique for Decision making in Construction, Hongkong University Press, HKU, 2004.
6. Schroeder, R.G, "Operations Management", McGraw Hill, 2009.
7. Vohra, Nd., "Quantitative Techniques in Management", Third Edition, Tata McGraw-Hill Company Ltd, 2007.

15CE3006 CONSTRUCTION PROJECT MANAGEMENT

Credits: 3:0:0

Course Objectives:

- Understand various management techniques for successful completion of construction projects.
- Understand the effect of management for project organization, design of construction process, labour, material and equipment utilization, and cost estimation.

Course Outcome:

On completion of this course the students will be able to

- Apply the modern trends in project management viz
- Design and cost estimate for the project construction
- Maximize the use of resource unitisation

Description:

Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers - Project Management –Constructor Sequence - Design and Construction as an Integrated System – Innovation, Technological and economical feasibility - Functional Design - Construction Site Environment - Job-Site Productivity - Labour Relations - Collective Bargaining - Materials Management - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks - Cost Estimation - Estimate Based on Engineer's List of Quantities - Operating Costs.

References:

1. Chitkara, K.K., “Construction Project Management: Planning, Scheduling and Control”, Tata McGraw-Hill Publishing Company, New Delhi, 2010.
2. Jack R. Meredith, Samuel J. Mantel, “Project Management: A Managerial Approach”, John Wiley and Sons, 2011
3. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pittsburgh, 2000.
4. Frederick E. Gould, “Construction Project Management”, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
5. George J.Ritz and Sidney Levy, “Total Construction Project Management”, McGraw-Hill Inc, 2013.
6. Mishra R. C and Tarun Soota, “Modern Project Management”, New Age International (P) Limited, Publishers, 2006

15CE3007 ADVANCED CONSTRUCTION TECHNIQUES

Credits: 3:0:0

Course Objectives:

- Understand the latest construction techniques applied to engineering construction for sub structure, super structure, special structures
- Knowledge on rehabilitation and strengthening techniques and demolition techniques

Course Outcome:

On completion of this course the students will be able to

- Apply the modern construction techniques to be used in the construction
- Organize rehabilitation and strengthening techniques.
- Execute the operations of the project sequentially.

Description:

Jacking - Under water construction of diaphragm walls and basement - Laying operations for built up offshore system - Large reservoir construction - Concrete paving technology – Techniques of construction of tall buildings - Large span structures – Erection of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges - Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks. Seismic retrofitting - Protection methods of structures – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques. Demolition Techniques - Advanced techniques using Robotic Machines

References:

1. Gajaria G.T., “Laws Relating to Building and Engineering Contracts in India”, LexisNexis Butterworths India, 2000
2. Jimmie Hinze, “Construction Contracts”, McGraw Hill, 2001.
3. Joseph T. Bockrath, “Contracts and the Legal Environment for Engineers and Architects”, McGraw Hill, 2000.
4. Thomas E. Uher, Philip Davenport, “Fundamentals of Building Contract Management”, UNSW Press. 2009
5. Paul Watson, Tim Howarth, “Construction Quality Management: Principles and Practice”, Routledge, 2012
6. Bajirao Shankarrao Patil, “Civil Engineering Contracts and Estimates”, Universities Press (India) Private Limited, 2006.

15CE3008 CONTRACT LAWS AND REGULATIONS

Credits: 3:0:0

Course Objectives:

- Understand the various types of construction contracts and their legal aspects and provisions.
- Knowledge on the tenders, arbitration, legal requirement, and labour regulations.

Course Outcome:

On completion of this course the students will be able to

- Classify the contracts in construction
- Apply various regulations for construction
- Combine suitable laws for the project under consideration

Description:

Indian Contracts Act – Elements of Contracts – Types of Contracts – Design of Contract Documents – Law of Torts - Prequalification – Bidding – Accepting – Evaluation of Tenders – Contract Formation and Interpretation – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act - Comparison of Actions and Laws – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence - Enforcement of Award – Costs Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws and their Influence on Construction Costs – Legal Requirements for Planning – Statutory Regulations - Social Security – Welfare Legislation – Insurance and Safety Regulations - Other Labour Laws.

References:

1. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", Lexis Nexis Butterworths India, 2000
2. Jimmie Hinze, "Construction Contracts", 2nd Edition, McGraw-Hill, 2001
3. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", 6th Edition, McGraw-Hill, 2000
4. Hugh Collins, "The Law of Contract", Cambridge University Press, 2003
5. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000.

15CE3009 CONSTRUCTION PLANNING, SCHEDULING AND CONTROL

Credits: 3:0:0

Course Objectives:

- Understand the concept of planning, scheduling, cost and quality control,
- Knowledge on safety during construction,
- Organization and use of project information necessary for construction project.

Course Outcome:

On completion of this course the students will be able to

- Develop suitable scheduling for execution
- Choose control methods for cash flow
- Adopt modern technology for information

Description:

Basic Concepts in the Development of Construction Plans – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Construction Schedules – Critical Path Method – Scheduling with Resource Constraints and Precedence's – Use of Advanced Scheduling Techniques – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Tradeoffs - The Cost Control Problem – The Project Budget – Control of Project Cash Flows –Schedule Control - Quality and Safety Concerns in Construction – Statistical Quality Control with Sampling by Attributes and Variables – Safety - Types of Project Information – Computerized Organization and Use of Information – Information Transfer and Flow.

References:

1. Albert Lester Project Management, "Planning and Control: Managing Engineering, Construction and Manufacturing", Butterworth-Heinemann, 2013
2. Daniel W. Halpin, Bolivar A. Senior, "Financial Management and Accounting Fundamentals for Construction", John Wiley and Sons. 2011
3. Saleh A. Mubarak, "Construction Project Scheduling and Control", John Wiley and Sons, 2010
4. Charles Patrick, "Construction Project Planning and Scheduling", Pearson Education India. 2000
5. Willem Kymmell,"Building Information Modeling: Planning and Managing Construction Projects", McGraw Hill Professional. 2008
6. Chitkara, K.K., "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 2010.
7. Sandra Christensen Weber, "Scheduling Construction Projects: Principles and Practices", Pearson Prentice Hall, 2005

15CE3010 ADVANCED CONSTRUCTION ENGINEERING AND COMPUTING TECHNIQUES LABORATORY

Credit: 0:0:2

Course Objectives:

- Knowledge on material selection through the material testing based on specification
- Utilizing the sophisticated spread sheets programs,
- Application on estimation software and other package programs

Course Outcomes:

On completion of this laboratory course students will be able to

- Design the concrete mixes as per IS, ACI and BS methods.
- Apply various tests on hardened concrete
- Develop scheduling of constructions projects using tools like primavera and MS projects.

Description:

Mix design - Flow characteristics of Self Compacting concrete - workability, strength and durability studies - Quantity takeoff, preparation and delivery of the bid or proposal of an engineering construction project - Design of a simple equipment information system for a construction project - Scheduling of a small construction project using Primavera scheduling systems including reports and tracking - Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking - Simulation models for project risk analysis.

References:

1. Neville, A.M., "Concrete Technology", Longman Scientific and Technical, England, 2008.
2. Krishnaraju, N., "Design of concrete mixes", Sehgal Educational Consultants and Publishers Pvt. Ltd., Faridabad, 2007.
3. Primevera, Software Manual

15CE3011 QUALITY CONTROL LAB

Credit: 0:0:2

Course Objectives:

- Hands on training on testing of cement and aggregates
- Hands on training on testing of concrete
- Knowledge on mix design procedures
- Knowledge on testing of highway materials

Course Outcome:

On completion of this course the students will be able to

- Carry out the experiments on materials
- Perform the analysis on test results
- Suggest the good materials for construction

Description:

Tests on Cement - Tests on Fine Aggregate - Tests on Coarse Aggregate - Test on Fresh Concrete - Tests on Hardened Concrete – Analysis of Results - Non Destructive Test

References:

1. Shetty, M. S., `Concrete Technology', S. Chand and Co., New Delhi, 2005.
2. M L Gambhir; Neha Jamwal, "Building and Construction Materials: Testing and Quality Control", 1e (Lab Manual), Tata McGraw-Hill Education. 2014
3. Khanna, S.K., and Justo C.E.G., Highway Engineering, Nem Chand and Bros. 2005.
4. Hamant. Sood, "Laboratory Manual on Testing of Engineering Materials", New Age International. , 2003

15CE3012 CONSTRUCTION PERSONNEL MANAGEMENT

Credit: 3:0:0

Course Objectives:

- Fundamentals of human behaviour under various situations
- Relate the behaviour pattern to manpower planning in organizational setups
- Understand the means of management of construction personnel
- Knowledge on the methods to adopt training as a tool for improvement

Course Outcome:

On completion of this course the students will be able to

- Apply various processes in manpower planning
- Make use of human resources effectively
- Choose appropriate organization and welfare measures.

Description:

Manpower planning, organizing, staffing, directing, and controlling – personal principles - Organization charts – Staffing plan – Development and Operation of human resources – managerial Staffing – Recruitment – Selection – Placement Human management – basic individual psychology – job design and performance management – Managing groups at work – Leadership – Behavioral aspects of decision making; and communication for human management - Compensation – Wages and Salary, employee benefits, employee appraisal and assessment – Employee services – Safety and Health – Discipline and discharge – Special Human resource problems – Employee handbook and personal manual - Productivity of Human resources – Staff training and evaluation

References:

1. Dwivedi R.S, "Human Relations and Organisational Behaviour", Macmillian India Ltd., 2005.
2. Charles D. Reese, James Vernon Eidson, "Handbook of OSHA Construction Safety and Health", Second Edition, CRC Press. 2006
3. Reddy R.J., "Personnel Management", APH Publishing, 2004
4. Andrew Dainty, Martin Loosemore, "Human Resource Management in Construction: Critical Perspectives", Routledge, 2013
5. Paul S. Chinowsky, Anthony D. Songer, "Organization Management in Construction", Routledge, 2011
6. Dwived R.S. "Human Relations and Organizational Behaviour", Macmillan, 2011

15CE3013 SHORING, SCAFFOLDING AND FORMWORK

Credit: 3:0:0

Course Objectives:

- Understand the overall and detailed planning of formwork, plant and site equipment.
- Understand the design and erection of forms for various elements such as slabs, beams, columns, walls, shells and tunnels.
- Knowledge on the latest methods of form construction.

Course Outcome:

On completion of this course the students will be able to

- Detail the planning of formwork,
- design the formworks and
- Formulate the erection methods of form work.

Description:

Planning, Site Equipment and Plant for Form Work - General Objectives - Planning for Safety - Basic System - Cost Reduction - Overall Programme - Detailed Programme - Scaffold Frames - Framed Panel Formwork - Materials Accessories Proprietary Products and Pressures - Lumber, Plywood, Reconstituted Wood, Steel, Aluminum, Hardware and Fasteners - Uplift on Shores - Design of Forms and Shores - Building and Erecting the Form Work - Forms for Domes and Tunnels, Slip forms and Scaffolds

References:

1. Mary Krumboltz Hurd, "Formwork for Concrete", American Concrete Institute. 2005
2. JHA, "Formwork for Concrete Structures", Tata McGraw-Hill Education. 2012
3. "The Code of Federal Regulations of the United States of America" U.S. Government Printing Office, 2004
4. Raissa Patricia Douglas Ferron, "Formwork Pressure of Self-consolidating Concrete: Influence of Flocculation", Pro Quest. 2008.

15CE3014 RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION

Credit: 3:0:0

Course Objectives:

- Understand the management and control of various resources involved in construction.
- Knowledge on the effect of resource planning, labour management, material and equipment, time management, and resource allocation and resource leveling in construction.

Course Outcome:

On completion of this course the students will be able to

- Allocate and resource leveling in construction.
- Formulate resource planning and management
- Develop the attitude of time management

Description:

Resource Planning, Procurement, Identification, Personnel - Planning for material, Labour, time schedule and cost control - Labour Management - Systems approach, Characteristics of resources, Utilization - Materials and Equipment - Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution – Equipment utilization - Time Management - Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects – Cash flow and cost control - Resource allocation - computer application

References:

1. Andrew P. Sage, William B. Rouse, “Handbook of Systems Engineering and Management”, John Wiley and Sons. 2011
2. Tang S.L., Irtishad U. Ahmad, Syed M. Ahmed, Ming Lu, “Quantitative Techniques for Decision Making in Constructio”, Hong Kong University Press. 2004
3. Thomas Uher, Adam S. Zantis., “Programming and Scheduling Techniques”, Routledge, 2012
4. Thomas Uher, Adam S. Zantis, “Programming and Scheduling Techniques”, Routledge. 2012
5. Andrew Whyte, “Integrated Design and Cost Management for Civil Engineers”, CRC Press, 2014

15CE3015 ECONOMICS AND FINANCE MANAGEMENT IN CONSTRUCTION

Credit: 3:0:0

Course Objectives:

- Understand the concepts of Construction Economic and Finance such as comparing alternatives proposals, evaluating alternative investments, management of funds, and management of accounting.

Course Outcome:

On completion of this course the students will be able to

- Apply the concepts in economics and finance in constructions
- Analyse the sources of finance and its utilization
- Solve financial issue using various methods

Description:

Basic Principles - Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest - Payment Methods - comparing alternatives proposals - Present Worth analysis, Annual Worth Analysis, Future Worth Analysis, Rate of return analysis and Incremental rate of return analysis – Evaluating alternative investments – Real estate - Funds Management - Sources of finance - Working Capital Management, Inventory valuation, Mortgage Financing - International financial management - Fundamentals of Management Accounting – principles - basic concepts, statements.

References:

1. Leland T. Blank, Anthony J. Tarquin, "Engineering Economy", McGraw-Hill, 2012.
2. Sasmita Mishra, "Engineering Economics and Costing", PHI Learning Pvt. Ltd., 2009
3. Patel, B M, "Project management- strategic Financial Planning, Evaluation and Control", Vikas Publishing House Pvt. Ltd. New Delhi. 2000
4. Shrivastava,U.K., "Construction Planning and Management",2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi. 2000
5. John A. White, Kenneth E. Case, David B. Pratt, "Principles of Engineering Economic Analysis", Wiley, 2012

15CE3016 PROJECT SAFETY MANAGEMENT

Credit: 3:0:0

Course Objectives:

- Understand the various safety concepts and requirements applied to construction projects.
- Knowledge on the construction accidents, safety programmes, contractual obligations, and design for safety.

Course Outcome:

On completion of this course the students will be able to

- Illustrate various constructions safety concepts
- Develop the safety culture in the work place
- Prioritize the responsibilities as an owner

Description:

Construction Accidents and their Causes – Human Factors in Construction Safety – Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications - Problem Areas in Construction Safety – Site Safety Assessment and Management – Substance Abuse – Safety Record Keeping - Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers - Top Management Practices – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation - Owner's responsibility – Role of designer in ensuring safety

References:

1. Richard J. Coble, Jimmie Hinze, Theo C. Haupt, "Construction Safety and Health Management", Prentice Hall Inc., 2000
2. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health Management, Prentice Hall Inc., 2001
3. David MacCollum, "Construction Safety Engineering Principles (McGraw-Hill Construction Series)", McGraw Hill Professional, 2007
4. Steve Rowlinson, "Construction Safety Management Systems", Routledge, 2004

15CE3017 MANAGEMENT INFORMATION SYSTEMS

Credit: 3:0:0

Course Objectives:

- Concepts of information systems and their applications
- Knowledge on system development and information systems
- Implementation of control and system audit.

Course Outcome:

On completion of this course the students will be able to

- Organize structured design using modern tools
- Choose suitable security measures.
- Assess the risk to interpret suitable solutions

Description:

Information Systems – Establishing the Framework – Business Models – Evolution of Information Systems - Modern Information System – Structured Methodologies – Designing Computer based Methods – Designing Structured Programs - Integrated Construction Management Information System – Project Management Information System – Functional Areas, Finance, Marketing, Production, Personnel – Comparison, Concepts and Knowledge Representation – Managing International Information System – Testing Security – Validating – Cost Benefit Analysis – Assessing the value and risk of Information System - Software Engineering qualities – Verification and Validation

References:

1. Caryn Alison Conley, " Design for Quality: The Case of Open Source Software Development", ProQuest, 2008
2. Effy Oz " Management Information Systems", Cengage Learning, 2008
3. Sadagopan S, "Management Information Systems, PHI Learning Pvt. Ltd., 2014
4. Johannes Govardus Maria van der, "Designing Management Information Systems", Oxford University Press, 2009
5. Kenneth C. Laudon, Jane Price Laudon, "Management Information Systems: Organization and Technology in the Networked Enterprise", Prentice Hall, 2000
6. Gordon Schulmeyer G., "Software Quality Assurance and Management", Artech House, 2008.
7. Janakiraman V. S., Sarukesi K., "Decision Support for Managers", Prentice Hall, 2008

15CE3018 URBAN LAND ECONOMICS

Credit: 3:0:0

Course Objectives:

- Understand the features of growth and use of urban land
- Knowledge on real estate market

Course Outcome:

On completion of the course the student will be able to

- Illustrate the knowledge of urban infrastructure development
- Survey the real estate market
- Estimate the land prices

Description:

Features of growth: geographical area of settlement – migration population and density – occupational pattern – Uses of urban land: factor in supply; effects of zoning and development control – Urban infra-structure: bulk delivery of civic services: communication and transportation – real estate market: investments in real estate – Development decisions: agencies for decisions – factors affecting urban land value – land prices in the major cities: determining forces: comparative variation: globalization and its effect.

References:

1. Cliff Moughtin, "Urban Design: Street and Square", Routledge, 2007
2. Richard U Ratchiff, "Urban land Economics", Mc Graw Hill Publishing Company, Pvt., Ltd., 2009
3. John F. McDonald, Daniel P. McMillen, "Urban Economics and Real Estate: Theory and Policy", John Wiley and Sons, 2010
4. Alan Evans, "Economics, Real Estate and the Supply of Land", John Wiley and Sons, 2008
5. Cornelis Van Kooten G, "Land Resource Economics and Sustainable Development: Economic Policies and the Common Good", UBC Press, 2011
6. Jean-Marie Huriot, Jacques-François Thisse, "Economics of Cities: Theoretical Perspectives", Cambridge University Press, 2000

15CE3019 - PRINCIPLES OF RATING AND INSURANCE

Credit: 3:0:0

Course Objectives:

- Knowledge on the sources of rating law in India
- Understand the valuation principles and techniques
- Understand the Insurance policies and loss claim

Course Outcome:

On completion of the course the student will be able to

- Interpret the taxes in the construction industry
- Assess insurance for different categories
- Evaluate the settlement issues

Description:

Differences between rating law in India, England and USA – valuation and levy of tax on property for municipal taxation purposes in the Indian context – principle of communibus annis and rebus sic stantibus – considerations for fixing ratable value - Unit of assessment - incidences of tax owner's share and occupier's share – Municipal taxes - profit basis and contractor's method– judicial decisions on rating - Insurance and Loss Assessment - liabilities – Policies– Risk management – Insurance market– valuation principles and techniques - inflation provisions, - obsolescence and betterment – principles of claim settlement – obligations and rights of insures and insured – third party claims

References:

1. Ian J. Bateman, "Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU, and Developing Countrie", Oxford University Press, 2001
2. Rangwala S. C., "Valuation of Real Properties", Charotar Publishing House Pvt. Limited, 2008
3. Peter Wyatt, "Property Valuation", John Wiley and Sons, 2013
4. Angadi D B, " Civic property Tax", Radha Publications, Madras, 2005
5. David Murphy, Russell D. Longcore, "Insurance Claim Secrets Revealed!", Russell Longcore, 2007
6. Jyotsna Sethi and Nishwan Bhatia, "Elements of Banking and Insurance", PHI Learning Pvt. Ltd., 2007

15CE3020 LAWS FOR ACQUISITION AND CONTRACT

Credit: 3:0:0

Course Objectives:

- Understand the Jurisprudence
- Understand the constitutional provisions, powers and functions sources of revenue
- Knowledge on Contract and Tort

Course Outcome:

On completion of the course the student will be able to

- Explain the laws of land acquisition
- Choose suitable contracts for projects
- Adapt suitable sales procedures

Description:

Elementary Jurisprudence: Law – its origin, source and ramifications – legislative enactments — Indian Legal system - salient features - Centre – State relationship – Local Government - rural and urban – constitutional provisions, powers and functions sources of revenue – Contract and Tort - formation of a contract - mis-representation and fraud – termination of contract - performance of contract - law of agency - tort affecting valuation – outline procedure for sale of immovable property - contract by correspondence – Acquisition and requisition of immovable property – enactments – land acquisition act 1894 (1 of 1894) – provisions for acquisition of land under the municipal laws – law of arbitration and conciliation

References:

1. Karl N. Llewellyn, Jurisprudence: Realism in Theory and Practice, Transaction Publishers, -2011
2. Curzon L. B., Routledge-Cavendish, " Jurisprudence", Psychology Press, 2002
3. Sharma, Sharma B.k, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., 2007
4. Nilima Bhadbhade Contract Law in India, Kluwer Law International, 2010
5. Suraj Prasad Singh, Indrajit P. Singh, "Law of Tort: Including Compensation Under the Consumer Protection Act", Universal Law Publishing Company, 2006
6. John Stephenson, "Building Regulations Explained", Taylor and Francis, 2001

15CE3021 TOWN AND REGIONAL PLANNING

Credit: 3:0:0

Course Objectives:

- Highlight on evolution of planning
- Understand the land use planning and management

Course Outcome:

On completion of the course the student will be able to

- Demonstrate effective town planning
- Choose suitable agencies for various activities
- Adopt suitable legal mechanism for planning

Description:

Evolution of Planning – planning practices in India – Planning process and hierarchy of planning - Principles and Necessity of town planning – uses of land – site planning – collection of data – types of surveys – preparation of layouts – land use planning and management – concept of city and Building byelaws - their effect on valuation – preparation of development plan – land use zoning principles and its effect on real estate – threshold theories for utility services - Agencies involved in plan, preparation and implementation: Effect of Development Plan on valuation - Legal mechanism for enforcement of planning document – Regional planning – laws affecting planning

References:

1. Rangwala S C, Rangwala K S, Rangwala P S, "A text Book of Town Planning", Charotar Publishing House Pvt. Ltd. 2009
2. Jonathan Barnett, "Urban Design as Public Policy and Architectural Record", Mc Graw Hill Publication, 2008
3. Kopardekar H D, "Social Aspects of Urban Planning", All India Institute of Local Self Government, Bombay, 2002
4. "Model Town and Country Planning Act" Published by Town and Country Planning Organization, Govt. of India. 2002

15CE3022 - VALUATION OF REAL ESTATE

Credit: 3:0:0

Course Objectives:

- Understand the Income approach to value
- Acquire knowledge on rate capitalization

Course Outcome:

On completion of the course the student will be able to

- Apply various methods for valuation of land
- Experiment with appropriate sale analysis techniques
- Assess the other factors influencing the value of property

Description:

Income approach to value – market approach to value – real estate market – cost approach to value: depreciated replacement cost – statistical and analytical methods in valuation – land characteristics – belting theory – hypothetical plotting scheme – hypothetical building scheme – transfer of development rights - market comparison techniques – adjustment grid model – regression analysis – residual technique – comparison by weight ages assigned to various factors – principles of income approach - sale analysis techniques and deriving rate of interest from sale transaction – rate capitalization – reversionary value of land – impact of other forms of investments on value of property

References:

1. Joni Larson, "Valuation Handbook", LexisNexis, 2014
2. Walter Roy Huber, William H. Pivar, "Real Estate Appraisal: Principles and Procedures", Educational Textbook Company, 2006
3. Peter Wyatt, "Property Valuation", John Wiley and Sons, 2013
4. Richard M. Betts, "Basic Real Estate Appraisal, OnCourse Learning, 2012
5. Ronald L. Brown, "Valuing Professional Practices and Licenses", Aspen Publishers, 2013

15CE3023 PROPERTY LAWS

Credit: 3:0:0

Course Objectives:

- Understand the laws related to immovable property
- Acquire knowledge on leases

Course Outcome:

On completion of the course the student will be able to

- Demonstrate the knowledge of laws pertaining to ownership of property
- Inspect transfer of immovable property
- Develop legal statements of possession of property as per the Indian acts

Description:

Laws relating to immovable property and easement – ownership and possession – co-ownership and concurrent ownership – co-operatives and condominiums – Transfer of Property Act 1882 – Transfer of Immovable property: sale, mortgage, gift, exchange, assignment – leases: lessor and lessee, sublease, period of lease, ground rent – expiration and renewal of leases – Indian Easement Act 1882 – Leave and license – laws of evidence – personal laws affecting inheritance of property – Indian Succession Act: Will and testament; succession certificate

References:

1. Ugo Mattei, "Basic Principles of Property Law: A Comparative Legal and Economic Introduction", Greenwood Publishing Group, 2000
2. Shailendra Kumar Awasthi and Dwivedi, "Law of Land Acquisition and Compensation", Law Agency, 2008
3. Avtar Singh, Harpreet Kaur, "Textbook on the Transfer of Property Act", Universal Law Publishing, 2009
4. Joseph Bockrath and Fedric Plotnick, "Contracts and the Legal Environment for Engineers and Architects", Mc Graw Hill Education, 7th Edition 2010
5. Das M N, "Laws Relating to Partition", Jawahar Publishers (p) Ltd. 2001

14CE3013 DESIGN OF STRUCTURES FOR DYNAMIC LOAD (V-1.1)

Credit: 3:0:0

Pre-requisite: 14CE3005-Structural Dynamics

Course Objective

- Knowledge on the basic principles of dynamic loads
- Behavior of structures subjected to dynamic loads

Course Outcome

At the end of the course student will be able to

- carry out analysis and design various tall buildings and other structures subjected to various Dynamic Loads.

Description

Dynamic loads, behavior under impact and cyclic loads: concrete, steel, masonry and soil – design against earthquakes: hydraulic structures, life line structures, terminal buildings, towers, tunnels. Design against blast and impact,design against wind and cyclone– aero elastic and aerodynamic effect - design as per BIS code of practice including gust factor approach – tall buildings, stacks and chimneys, Passive and active control of vibrations, new and favorable materials.

References

1. Andreas Kappos, "Dynamic Loading and Design of Structures", CRC Press, 2001
2. Ted Stathopoulos, Charalambos C. Baniotopoulos, "Wind Effects on Buildings and Design of Wind-Sensitive Structures", Springer Science and Business Media, 2007
3. VirdiK. S., MatthewsR, ClarkeJ. L,FikryGaras,"Abnormal Loading on Structures: Experimental and Numerical Modelling",CRC Press. 2000
4. Theodor Krauthammer, "Modern Protective Structures", CRC Press. 2008
5. Robert E. Englekirk Seismic Design of Reinforced and Precast Concrete Buildings", John Wiley and Sons, 2003

14CE201 PREFABRICATED STRUCTURES

Credits: 3:1:0

Course Objective:

- Design of Prefabricated structural components and its joints
- Design of prefabricated structures subjected to dynamic forces

Course Outcome:

At the end of the course, the student will be able to

- Understand the modular construction and industrialized construction
- Design the prefabricated elements
- Assemble the elements for the construction.

Unit I Introduction

Need for prefabrication – Principles – Materials – Modular coordination – Standardization Systems – Production – Transportation – Erection

Unit II Prefabricated Components

Behaviour of structural components – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

Unit III Design Principles

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

Unit IV Joint in Structural Members

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

Unit V Design for Abnormal Loads

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, explosions, fire. Importance of avoidance of progressive collapse

Text Books

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. John D. Quale., "Sustainable, Affordable, Prefab: The EcoMOD Project", University of Virginia Press, 2012
3. Maurice Levitt, "Precast Concrete: Materials, Manufacture, Properties and Usage", Taylor and Francis Group, 2007.
4. Lasslo Mokk, "Prefabricated concrete for Industrial and Public sectors", Akademiai Kiado, Budapest, 2004